Access DB# 118793

SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Raymond Alejandro Examiner # : 76895 Date: 04/05/04
Art Unit: 1745 Phone Number ~~30~~ (571)272-1282 Serial Number: 09/972606
Mail Box and Bldg/Room Location: Rem 6B59 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

****

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: Diaphragm Pump & Anode Stream Recirculation System using such pump for a Fuel Cell
Inventors (please provide full names): Jefferson Yang

Earliest Priority Filing Date: 10/05/01

****For Sequence Searches Only* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.***

Please, search for claims 1-15. See their subject matters in the attached copy.

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STAFF USE ONLY		Type of Search		Vendors and cost where applicable	
Searcher:	EZ	NA Sequence (#)		STN	$ 308.20
Searcher Phone #:		AA Sequence (#)		Dialog	
Searcher Location:		Structure (#)		Questel/Orbit	
Date Searcher Picked Up:		Bibliographic	✓	Dr.Link	
Date Completed:	4-7-04	Litigation		Lexis/Nexis	
Searcher Prep & Review Time:	10	Fulltext		Sequence Systems	
~~Clerical Prep Time:~~		Patent Family		WWW/Internet	
Online Time:	60	Other		Other (specify)	

PTO-1590 (8-01)

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=> file home
FILE 'HOME' ENTERED AT 13:10:30 ON 07 APR 2004


=> display history full l1-


     FILE 'HCA, WPIX, JAPIO' ENTERED AT 12:52:13 ON 07 APR 2004
L1          40578 SEA FUELCELL? OR FUEL?(2A)(CELL OR CELLS)
L2          22573 SEA FUELCELL? OR FUEL?(2A)(CELL OR CELLS)
L3          15047 SEA FUELCELL? OR FUEL?(2A)(CELL OR CELLS)
     TOTAL FOR ALL FILES
L4          78198 SEA FUELCELL? OR FUEL?(2A)(CELL OR CELLS)
L5            538 SEA DIAPHRAGM?(3A)PUMP?
L6           3055 SEA DIAPHRAGM?(3A)PUMP?
L7           1166 SEA DIAPHRAGM?(3A)PUMP?
     TOTAL FOR ALL FILES
L8           4759 SEA DIAPHRAGM?(3A) PUMP?
L9             53 SEA (ANOD## OR (NEG# OR NEGATIVE?)(2A)ELECTROD##)(3A)(REC
                  IRCULAT? OR RE(W)CIRCULAT? OR REDIRECT? OR RE(W)DIRECT?)
L10            77 SEA (ANOD## OR (NEG# OR NEGATIVE?)(2A)ELECTROD##)(3A)(REC
                  IRCULAT? OR RE(W)CIRCULAT? OR REDIRECT? OR RE(W)DIRECT?)
L11            11 SEA (ANOD## OR (NEG# OR NEGATIVE?)(2A)ELECTROD##)(3A)(REC
                  IRCULAT? OR RE(W)CIRCULAT? OR REDIRECT? OR RE(W)DIRECT?)
     TOTAL FOR ALL FILES
L12           141 SEA (ANOD## OR (NEG# OR NEGATIVE?)(2A) ELECTROD##)(3A)(RE
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                  DIRECT?)

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L13          2452 SEA (RECOVER? OR RECLAMAT? OR RECLAIM? OR RETRIEV? OR
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                  RECONSTITUT? OR REUSE# OR REUSING# OR RECYCL? OR
                  REPROCESS?)/BI,AB
L14           871 SEA REGENERAT? OR RECONDITION? OR RECONSTITUT? OR REUSE#
                  OR REUSING# OR RECYCL? OR REPROCESS?

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L15           644 SEA (ANOD## OR (NEG# OR NEGATIVE?)(2A)ELECTROD##)(3A)L14
L16           305 SEA (ANOD## OR (NEG# OR NEGATIVE?)(2A)ELECTROD##)(3A)L14
L17            83 SEA (ANOD## OR (NEG# OR NEGATIVE?)(2A)ELECTROD##)(3A)L14

     TOTAL FOR ALL FILES
L18          1032 SEA (ANOD## OR (NEG# OR NEGATIVE?)(2A) ELECTROD##)(3A)
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L19            23 SEA L9 AND L1
L20            27 SEA L10 AND L2
L21             8 SEA L11 AND L3
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     TOTAL FOR ALL FILES
L22         58 SEA L12 AND L4
L23          2 SEA L19 AND PUMP?
L24          6 SEA L20 AND PUMP?
L25          1 SEA L21 AND PUMP?
     TOTAL FOR ALL FILES
L26          9 SEA L22 AND PUMP?
L27          1 SEA L19 AND L5
L28          2 SEA L20 AND L6
L29          1 SEA L21 AND L7
     TOTAL FOR ALL FILES
L30          4 SEA L22 AND L8
L31        134 SEA L15 AND L1
L32         41 SEA L16 AND L2
L33         26 SEA L17 AND L3
     TOTAL FOR ALL FILES
L34        201 SEA L18 AND L4
L35          3 SEA L31 AND PUMP?
L36          1 SEA L32 AND PUMP?
L37          0 SEA L33 AND PUMP?
     TOTAL FOR ALL FILES
L38          4 SEA L34 AND PUMP?
L39          0 SEA L31 AND L5
L40          0 SEA L32 AND L6
L41          0 SEA L33 AND L7
     TOTAL FOR ALL FILES
L42          0 SEA L34 AND L8
L43          0 SEA L19 AND HALL
L44          1 SEA L20 AND HALL
L45          0 SEA L21 AND HALL
     TOTAL FOR ALL FILES
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L47          0 SEA L31 AND HALL
L48          0 SEA L32 AND HALL
L49          0 SEA L33 AND HALL
     TOTAL FOR ALL FILES
L50          0 SEA L34 AND HALL
L51          4 SEA L1 AND L5
L52         19 SEA L2 AND L6
L53          2 SEA L3 AND L7
     TOTAL FOR ALL FILES
L54         25 SEA L4 AND L8
L55          0 SEA L51 AND HALL
L56          1 SEA L52 AND HALL
L57          0 SEA L53 AND HALL
     TOTAL FOR ALL FILES
L58          1 SEA L54 AND HALL
L59        707 SEA L1 AND PUMP?
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L60         950 SEA L2 AND PUMP?
L61         596 SEA L3 AND PUMP?
     TOTAL FOR ALL FILES
L62        2253 SEA L4 AND PUMP?
L63           0 SEA L59 AND HALL
L64           1 SEA L60 AND HALL
L65           1 SEA L61 AND HALL
     TOTAL FOR ALL FILES
L66           2 SEA L62 AND HALL
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L68      112678 SEA ANOD## OR (NEG# OR NEGATIVE?)(2A)ELECTROD##
L69       70342 SEA ANOD## OR (NEG# OR NEGATIVE?)(2A)ELECTROD##
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L71         116 SEA L59 AND L67
L72         159 SEA L60 AND L68
L73          45 SEA L61 AND L69
     TOTAL FOR ALL FILES
L74         320 SEA L62 AND L70
L75       31004 SEA RECIRCULAT? OR RE(W)CIRCULAT?
L76       33041 SEA RECIRCULAT? OR RE(W)CIRCULAT?
L77        8359 SEA RECIRCULAT? OR RE(W)CIRCULAT?
     TOTAL FOR ALL FILES
L78       72404 SEA RECIRCULAT? OR RE(W) CIRCULAT?
L79          13 SEA L71 AND L75
L80          16 SEA L72 AND L76
L81           1 SEA L73 AND L77
     TOTAL FOR ALL FILES
L82          30 SEA L74 AND L78
L83           1 SEA L19 AND L51
L84           2 SEA L20 AND L52
L85           1 SEA L21 AND L53
     TOTAL FOR ALL FILES
L86           4 SEA L22 AND L54
L87           2 SEA L19 AND L79
L88           6 SEA L20 AND L80
L89           1 SEA L21 AND L81
     TOTAL FOR ALL FILES
L90           9 SEA L22 AND L82
L91           2 SEA L51 AND L79
L92           3 SEA L52 AND L80
L93           1 SEA L53 AND L81
     TOTAL FOR ALL FILES
L94           6 SEA L54 AND L82
L95           0 SEA L71 AND HALL
L96           1 SEA L72 AND HALL
L97           0 SEA L73 AND HALL
     TOTAL FOR ALL FILES
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L98            1 SEA L74 AND HALL

     FILE 'HCA' ENTERED AT 13:06:04 ON 07 APR 2004
L99            8 SEA L23 OR L27 OR L35 OR L51 OR L83 OR L87 OR L91
L100          10 SEA L79 NOT L99
L101          21 SEA L19 NOT (L99 OR L100)

     FILE 'WPIX' ENTERED AT 13:07:52 ON 07 APR 2004
L102           7 SEA L24 OR L28 OR L36 OR L44 OR L56 OR L64 OR L84 OR L88
                 OR L92 OR L96
L103          25 SEA (L52 OR L80) NOT L102
L104          21 SEA L20 NOT (L102 OR L103)

     FILE 'JAPIO' ENTERED AT 13:09:27 ON 07 APR 2004
L105           3 SEA L25 OR L29 OR L53 OR L65 OR L81 OR L85 OR L89 OR L93

L106           7 SEA L21 NOT L105


=> file japio
FILE 'JAPIO' ENTERED AT 13:14:00 ON 07 APR 2004
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FILE LAST UPDATED: 1 MAR 2004       <20040301/UP>
FILE COVERS APR 1973 TO NOVEMBER 28, 2003


=> d l105 1-3 ibib abs ind

L105 ANSWER 1 OF 3  JAPIO  (C) 2004 JPO  on STN
ACCESSION NUMBER:         2003-068336    JAPIO
TITLE:                    DIAPHRAGM PUMP FOR
                          FUEL CELL AND ANODE
                          FLOW RECIRCULATING SYSTEM USING THE
                          SAME PUMP
INVENTOR:                 YANG GENSEI
PATENT ASSIGNEE(S):       ASIA PACIFIC FUEL CELL TECHNOLOGY LTD
PATENT INFORMATION:

     PATENT NO       KIND  DATE         ERA     MAIN IPC
     ---------------------------------------------------------
     JP 2003068336   A     20030307     Heisei  H01M008-04

APPLICATION INFORMATION
     STN FORMAT:          JP 2002-212670        20020722
     ORIGINAL:            JP2002212670          Heisei
PRIORITY APPLN. INFO.:    TW 2001-120011     20010815
SOURCE:                   PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined
```

Applications, Vol. 2003
AN 2003-068336 JAPIO
AB PROBLEM TO BE SOLVED: To improve current **anode** flow **recirculating** systems.
SOLUTION: An **anode** flow **recirculating** system for a **fuel cell** 80 having an **anode** gas inlet 82 and an **anode** gas outlet 84 comprises an **anode** gas resource 60, a switch 62 connected to the **anode** gas resource 60, a pressure controller 64 connected between the switch 62 and the **anode** gas inlet 82, and a **diaphragm pump** 70 so connected between the **anode** gas outlet 84 and the **anode** gas inlet 82 that the **anode** gas **recirculation** is made, wherein the **diaphragm pump** 70 has sensors 106 and 108 connected to the switch 62.
COPYRIGHT: (C)2003,JPO
IC ICM H01M008-04

L105 ANSWER 2 OF 3 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2001-076735 JAPIO
TITLE: HONDA-FUJISHIMA-**HALL** PHOTOCATALYST LIGHT SYNTHESIS **FUEL CELL**
INVENTOR: IZUMI SUMIO
PATENT ASSIGNEE(S): IZUMI SUMIO
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2001076735	A	20010323	Heisei	H01M004-90

APPLICATION INFORMATION
STN FORMAT: JP 1999-327285 19970516
ORIGINAL: JP11327285 Heisei
PRIORITY APPLN. INFO.: JP 1999-327285 19970516
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001
AN 2001-076735 JAPIO
AB PROBLEM TO BE SOLVED: To improve the function of a TiO_2 photocatalyst used for an environmental pollution process to an implementation level by radiating pulse ultraviolet rays in a magnetic field to an electric double-layer control catalyst film arranged between solenoid couples.
SOLUTION: An electric double-layer control catalyst film in a loop or a cylinder of a P or N-photoconductor arranged in the pulse magnetic field by upper and lower solenoid couples 1 with a P-N junction device is electromagnetically induced and polarized into an excited state. Pulse UVR 3 are radiated to it, photoelectrons are expelled to control positive holes, the desorbed photoelectrons are

bonded to the hydrogen in the air or are arrested by emitters or Pt on both sides of an insulator. Amorphous anatase is vacuum-deposited or sputtered on a quartz-reinforced plastic short-fiber sheet to form an electric double-layer control catalyst film 2 serving as a photodesorption electron **pump**. A satisfactory oxidation reduction process is realized accordingly.

IC ICM H01M004-90
ICS H01M014-00

L105 ANSWER 3 OF 3 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1997-259912 JAPIO
TITLE: GAS CIRCULATION PUMP SYSTEM FOR **FUEL CELL**
INVENTOR: TANI TOSHIHIRO; KUDOME OSAO
PATENT ASSIGNEE(S): MITSUBISHI HEAVY IND LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 09259912	A	19971003	Heisei	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 1996-65987 19960322
ORIGINAL: JP08065987 Heisei
PRIORITY APPLN. INFO.: JP 1996-65987 19960322
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1997

AN 1997-259912 JAPIO

AB PROBLEM TO BE SOLVED: To ensure a safe and long time operation by placing an operation casing having a recess part in an airtight vessel, and vibrating a diaphragm layed stretchwise at an opening of the recess.

SOLUTION: Hydrogen and oxygen are supplide to a **fuel cell** main body through a supply pipe to generate an electrochemical reaction, implementing power generation. Unreacted gas discharged therefrom is returned to the pipe by means of a circulation pump. In such a circulation pump system for a **fuel cell,** a **diaphragm pump** is used for the circulation pump. This pomp 8A is installed in an operation casing 13 having a recess part 19 in a vessel 11 capable of being retained in an airtight condition, the diaphragm 22 layed stretchwise across the recessed part 19 is vibrated up and down through a rod 25 mounted on a rotary plate 24 and a vibrator 26. The recess 19 is communicated with intake and discharge pipes 14, 15 for unreacted gas inserted from an upper cover 23 through a seal device 18. The inside of the vessel 11 is controlled in its pressure by the pressure control gas supplied from a gas supply port 12.

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IC ICM H01M008-04
ICS F04B043-02; H01M008-12

=> file wpix
FILE 'WPIX' ENTERED AT 13:17:14 ON 07 APR 2004

FILE LAST UPDATED: 5 APR 2004 <20040405/UP>
MOST RECENT DERWENT UPDATE: 200423 <200423/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

=> d l102 1-7 max

L102 ANSWER 1 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2004-024278 [03] WPIX
DNN N2004-019015 DNC C2004-007890
TI Hydrogen gas separator to supply a **fuel cell** is operated at more efficient reduced downstream pressure by using a positive displacement circulating **pump**.
DC E36 J01 L03 X16 X21 X22
IN LAMM, A; POSCHMANN, T
PA (DAIM) DAIMLERCHRYSLER AG
CYC 1
PI DE 10241668 A1 20031127 (200403)* 5p C01B003-56
ADT DE 10241668 A1 DE 2002-10241668 20020909
PRAI DE 2002-10241668 20020909
IC ICM C01B003-56
ICS B01D053-22
AB DE 10241668 A UPAB: 20040112
NOVELTY - A hydrogen separator module (1), for supplying pure hydrogen gas to a **fuel cell**, is operated at a downstream pressure of less than 1.2 bar absolute, and preferably less than the cell ambient pressure, by use of a **diaphragm pump** to circulate gas through the **anode** chamber (5).

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for an arrangement able to achieve low downstream pressure at the separator, and also for application of the arrangement as a motor vehicle auxiliary power unit.

USE - Auxiliary power units for motor vehicles.

ADVANTAGE - Positive displacement **pump** enables separator downstream pressure to be kept low, and the increased differential pressure provides improved efficiency.

DESCRIPTION OF DRAWING(S) - Figure shows a flow diagram for a separation module (1) feeding the **anode** chamber (5) of a

fuel cell with hydrogen gas **recirculated**
by a **diaphragm pump** (6).
Dwg.1/3
TECH DE 10241668 A1 UPTX: 20040112
TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Low pressure conditions downstream of a separator (1) may also be achieved with an ejector (7) using as motive fluid, **recirculating** water at 5-10 bar absolute, from a **pump** (9).
KW [1] 97153-0-0-0 CL PRD
FS CPI EPI
FA AB; GI; DCN
MC CPI: E11-Q01; E31-A02; J01-E03E; L03-E04G
EPI: X16-C16; X21-A01F; X21-B01A; X22-F01
DRN 1532-P; 1532-U
CMC UPB 20040112
M3 *01* C101 C550 C810 M411 M424 M720 M740 M904 M905 N120 N520 N521
Q454
DCN: R01532-K; R01532-P

L102 ANSWER 2 OF 7 WPIX
AN 2003-417917 [39] WPIX
DNN N2003-333319
TI **Anode** stream **recirculation** system for **fuel cell**, has **diaphragm pump** connected with both **anode** gas output and input, comprising sensors electrically connected with switch through which **anode** gas flows.
DC Q56 X16
IN YANG, J Y
PA (ASPA-N) ASIA PACIFIC FUEL CELL TECHNOLOGIES LTD
CYC 3

PI	US 2003035986	A1	20030220	(200339)*	10p	H01M008-04
	JP 2003068336	A	20030307	(200340)	7p	H01M008-04
	TW 511316	A	20021121	(200353)		H01M008-04

ADT US 2003035986 A1 US 2001-972606 20011005; JP 2003068336 A JP 2002-212670 20020722; TW 511316 A TW 2001-120011 20010815
PRAI TW 2001-120011 20010815
IC ICM H01M008-04
ICS F04B043-02
AB US2003035986 A UPAB: 20030619
NOVELTY - The **anode** gas supply (60) provides **anode** gas required for the reaction proceeded in **fuel cell** (80). The gas flows through a switch (62) and a pressure regulating device (64), before entering the **fuel cell**. A **diaphragm pump** (70) connected with both the **anode** gas output (84) and the **anode** gas input (82) of the **fuel cell**, has the sensors (106,108) electrically connected with the switch.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for the **diaphragm pump** for **fuel cell.**

USE - **Anode** stream **recirculation** system for **fuel cell.**

ADVANTAGE - The excessive hydrogen discharged from the **fuel cell**, is collected continuously using the **diaphragm pump**, and the collected hydrogen is discharged back into **fuel cell** for reaction. The usage of hydrogen **pump** is eliminated, and the parasitic loss of electrical energy of **fuel cell** itself can be reduced, and the overall efficiency of the electrical power generation by the **fuel cell** system can be improved.

DESCRIPTION OF DRAWING(S) - The figure shows the schematic diagram of the **anode** gas **recirculation** system.

anode gas supply 60
switch 62
pressure regulating device 64
diaphragm pump 70
fuel cell 80
anode gas input 82
anode gas output 84
sensors 106,108
Dwg.5/7

FS EPI GMPI
FA AB; GI
MC EPI: X16-C09; X16-C15

L102 ANSWER 3 OF 7 WPIX
AN 2003-291960 [29] WPIX
DNN N2003-232224
TI **Diaphragm pump** that collects and **recirculates** excess hydrogen discharged from a **fuel cell** and redirects the hydrogen back into the **fuel cell.**
DC Q56 X16
IN YANG, Y; YS YANG, J
PA (YATA-N) YATAI FUEL CELL SCI & TECHNOLOGY CO LTD; (ASPA-N) ASIA PACIFIC FUEL CELL TECHNOLOGIES LTD
CYC 31
PI EP 1288498 A2 20030305 (200329)* EN 11p F04B043-06
R: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR
CN 1407644 A 20030402 (200345) H01M008-04
ADT EP 1288498 A2 EP 2002-14823 20020703; CN 1407644 A CN 2001-124277 20010823
PRAI CN 2001-124277 20010823

IC ICM F04B043-06; H01M008-04
AB EP 1288498 A UPAB: 20030505
NOVELTY - The **diaphragm pump** (70) has a piston (90) over which a rubber diaphragm (92) is attached to divide the inner space into two parts (102,104). Two **Hall** effect sensors (106,108) are mounted on the top and bottom of the **pump** and a magnet (110) is mounted on the piston (90). As the piston moves up and down the sensors detect the approach of the magnet and transmit signals to activate a switch (62) which controls the **anode** gas valve.

DETAILED DESCRIPTION - An independent claim is included for an **anode** stream **recirculation** system for a **fuel cell**

USE - To continuously collects hydrogen discharged from the **fuel cell**

ADVANTAGE - Eliminates conventional hydrogen **pump**; electrical losses are reduced, efficiency of power generation is increased.

DESCRIPTION OF DRAWING(S) - Schematic drawing of gas **recirculation** system with **diaphragm pump**

Switch 62
Pump 70
Piston 90
Diaphragm 92
Inner space 102,104
Sensors 106,108
Magnet 110
Dwg.5/7

FS EPI GMPI
FA AB; GI
MC EPI: X16-C09; X16-C15

L102 ANSWER 4 OF 7 WPIX
AN 2003-029267 [02] WPIX
DNN N2003-023105
TI **Fuel cell** power plant for vehicle drive system, has **recirculation pump** installed in **anode** effluent **recirculation** passage, to pressurize effluent.
DC X16 X21
IN KASHIWAGI, N
PA (NSMO) NISSAN MOTOR CO LTD
CYC 2
PI US 2002136942 A1 20020926 (200302)* 10p H01M008-04
JP 2002352825 A 20021206 (200310) 6p H01M008-04
ADT US 2002136942 A1 US 2002-95535 20020313; JP 2002352825 A JP 2002-74035 20020318
PRAI JP 2001-84943 20010323

IC ICM H01M008-04
AB US2002136942 A UPAB: 20030111
NOVELTY - A **fuel cell** stack (1) generates electric power by the reaction of hydrogen and air, and discharges hydrogen containing the **anode** effluent, which is **recirculated** by a passage (5B). An ejector (6) promotes recitation of the effluent by exerting suction force on the effluent based on hydrogen flow velocity in a hydrogen supply passage (12). A **recirculation pump** (11) installed in the effluent **recirculation** passage, pressurizes the effluent.
USE - For vehicle drive system.
ADVANTAGE - Minimizes wastage of hydrogen by forcibly **recirculating anode** effluent using the **recirculation pump.**
DESCRIPTION OF DRAWING(S) - The figure shows the schematic view of the **fuel cell** power plant.
Fuel cell stack 1
Passage 5B
Ejector 6
Recirculation pump 11
Hydrogen supply passage 12
Dwg.1/8
FS EPI
FA AB; GI
MC EPI: X16-C09; X16-C15; X21-A01F; X21-B01A

L102 ANSWER 5 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-698694 [75] WPIX
DNN N2002-550932 DNC C2002-197893
TI Processing of hydrocarbon fuel, e.g., methane, involves reforming hydrocarbons by reacting them with carbon dioxide and water, and sensible heat from power generation reaction to produce hydrogen gas and carbon monoxide.
DC E36 H04 L03 X16
IN MEACHAM, G B K
PA (MEAC-I) MEACHAM G B K
CYC 100
PI WO 2002069430 A2 20020906 (200275)* EN 43p H01M008-06
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VN YU ZA ZM ZW
ADT WO 2002069430 A2 WO 2002-US5853 20020222
PRAI US 2001-271295P 20010223
IC ICM H01M008-06

ICS H01M008-00; H01M008-04; H01M008-24

AB WO 200269430 A UPAB: 20021120

NOVELTY - A hydrocarbon fuel is processed by reforming hydrocarbons by reacting them with carbon dioxide and water and sensible heat from power generation reaction to produce hydrogen gas and carbon monoxide.

DETAILED DESCRIPTION - Processing of hydrocarbon fuel involves adding oxygen from **anode** (3, 12) of a **fuel cell** in the form of carbon dioxide and water; reforming the hydrocarbons by reacting them with carbon dioxide and water and sensible heat from power generation reaction to produce hydrogen gas and carbon monoxide; reacting the hydrogen gas and carbon monoxide at the **anode** to produce power; and mechanically mixing the fuel and the reaction products.

INDEPENDENT CLAIMS are included for the following:

(a) a solid fuel reactor comprising a high temperature **fuel cell** having an **anode** and mechanism for circulating the **anode** reaction products so that the **anode** reaction products alternately contact the solid fuel and the **anode**;

(b) a **fuel cell** power generation comprising the reactor and a second stage **fuel cell** stack where the fuel and reaction product mixture exhaust stream having fuel gas stream to the second stage **fuel cell** stack;

(c) a **fuel cell** including a **anode** passage and an **anode** gas **recirculation** loop in which fuel is added to the **anode** gas stream at an intermediate point in the **anode** passage such that the fuel is mixed with **anode** reaction products, and an oxidant flows in a cathode (5, 14) passage parallel to the **anode** passage;

(d) a multiple manifold hollow cathode supported solid planar bipolar **fuel cell** stack comprising multiple cells where the oxidant flows between oxidant inlet and oxidant outlet holes through oxidant passages (24) within the hollow cathodes, fuel flows between fuel inlet and fuel outlet holes through fuel passages between adjacent cells; one side of each cell is coated with electrolyte (4, 13) and **anode** layers; the opposite sides are coated with a lanthanum chromite; interconnect layers and a conductive current distribution layers; and current flows from one cell to the next through a multiplicity of contact areas between the **anode** of one cell and the conductive current distribution layer of the next cell; and

(e) an integrated **fuel cell** comprising **fuel cell** power generation system together with mechanism for interconnecting the reactor and the second stage **fuel cell** stack, common thermal enclosure

mechanism, heat recovery mechanism, fluid **pumping** mechanism, fuel introduction mechanism, startup mechanism; and control mechanism.

USE - For processing hydrocarbon fuel, e.g., methane, higher hydrocarbons, and alcohol, and also including liquid fuel, solid fuel, e.g., coal or gas fuels.

ADVANTAGE - The invention allows hydrocarbon fuels, including solid fuels, to be utilized in a **fuel cell** with minimal auxiliary equipment, e.g., reformers and heat exchangers, which in turn leads to power generation system with reduced size, weight and cost. It can also be applied to a high temperature **fuel cell** configuration and types including solid oxide **fuel cells** and molten carbonate **fuel cells.**

DESCRIPTION OF DRAWING(S) - The figure is a schematic view of the operating principle of the mixed fluid internal fuel reforming concept.

Second stage **fuel cell** 1
Anode 3, 12
Electrolyte 4, 13
Cathode 5, 14
Oxidant passages 24
Dwg.1/15

TECH WO 200269430 A2UPTX: 20021120
TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred Components: The concentration of fuel in the mixture of fuel and reaction products is lower than the soot formation unit. The second stage **fuel cell** (2) is operated in plug flow mode to increase fuel utilization. The oxidant is first passed over the cathode of the second stage **fuel cell** and then passed over the cathode of the **fuel cell** in the reactor. The electrolyte layer and the lanthanum chromite interconnect layer of the cell join at the cell outer perimeter and at the inner perimeter of each of the fuel inlet and fuel outlet holes, such that the oxidant gas is confined within the hollow cathodes.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Components: The steam/carbon molar ratio is 0.25-3.

KW [1] 97153-0-0-0 CL PRD; 783-0-0-0 CL PRD; 217-0-0-0 CL; 0076-97202 CL; 0076-97201 CL
FS CPI EPI
FA AB; GI; DCN
MC CPI: E31-A01; H04-E06; L03-E04
EPI: X16-C09
DRN 1423-P; 1423-U; 1532-P; 1532-U; 1779-S; 1779-U
CMC UPB 20021120
M3 *01* C101 C550 C810 M411 M720 M904 M905 N120 N515 Q413

```
             DCN: R01532-K; R01532-P
     M3   *02* C106 C108 C550 C730 C800 C801 C802 C803 C805 C807 M411 M720
               M904 M905 M910 N120 N515 Q413
               DCN: R01423-K; R01423-P
     M3   *03* C108 C550 C810 M411 M730 M904 M905 M910
               DCN: R01779-K; R01779-S
     M3   *04* H4   H401 H481 H8   M210 M211 M212 M213 M214 M215 M216 M220
               M221 M222 M223 M224 M225 M226 M231 M232 M233 M272 M281 M320
               M416 M620 M730 M904 M905
               DCN: 0076-97202-K; 0076-97202-S
     M3   *05* M210 M211 M212 M213 M214 M215 M216 M220 M221 M222 M223 M224
               M225 M226 M231 M232 M233 M320 M416 M610 M620 M730 M904 M905
               DCN: 0076-97201-K; 0076-97201-S

L102 ANSWER 6 OF 7  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   2002-426630 [45]   WPIX
DNN  N2002-335481       DNC C2002-120980
TI   Supplying of hydrogen gas stream to fuel cell
     anode, involves introducing feed gas stream to adsorption
     module having chemically distinct adsorbents which adsorb
     contaminant to produce pure hydrogen gas stream.
DC   E36 J01 J04 L03 Q14 X16
IN   KEEFER, B; ROY, S; SAWADA, J; BROWN, M; JOHANNES, E; BROWN, M J;
     JOHANNES, E P; KEEFER, B G; SAWADA, J A
PA   (QUES-N) QUESTAIR TECHNOLOGIES INC; (BROW-I) BROWN M J; (JOHA-I)
     JOHANNES E P; (KEEF-I) KEEFER B G; (ROYS-I) ROY S; (SAWA-I) SAWADA J
     A
CYC  98
PI   WO 2002035623 A2 20020502 (200245)* EN   55p    H01M008-00
        RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
            MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
         W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
            DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP
            KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ
            NO NZ PH PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG
            US UZ VN YU ZA ZW
     CA 2324699    A1 20020427 (200245)  EN          H01M008-06
     CA 2324702    A1 20020427 (200245)  EN          H01M008-06
     US 2002098394 A1 20020725 (200254)              H01M008-04
     AU 2002014858 A  20020506 (200257)              H01M008-00
     EP 1344270    A2 20030917 (200362)  EN          H01M008-06
         R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
            NL PT RO SE SI TR
ADT  WO 2002035623 A2 WO 2001-CA1523 20011026; CA 2324699 A1 CA
     2000-2324699 20001027; CA 2324702 A1 CA 2000-2324702 20001027; US
     2002098394 A1 US 2001-39552 20011026; AU 2002014858 A AU 2002-14858
     20011026; EP 1344270 A2 EP 2001-983346 20011026, WO 2001-CA1523
     20011026
```

FDT AU 2002014858 A Based on WO 2002035623; EP 1344270 A2 Based on WO 2002035623
PRAI CA 2000-2324702 20001027; CA 2000-2324699 20001027
IC ICM H01M008-00; H01M008-04; H01M008-06
ICS B60L011-18; H01M008-10; H01M008-22
AB WO 200235623 A UPAB: 20020717

NOVELTY - A feed gas stream containing hydrogen and a contaminant is introduced into adsorption module having adsorbents (A,B), steam reforming catalyst and water gas shift reaction catalyst. The adsorbents are chemically distinct, and one of the adsorbent (A or B) adsorbs contaminant in feed gas stream to produce purified gas stream of hydrogen. The purified stream is introduced to a **fuel cell anode.**

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:

(1) separation of carbon monoxide from gas stream containing hydrogen, involves introducing the feed stream to the rotary pressure swing adsorption module for separating portion(s) of carbon monoxide, and introducing purified gas stream to **fuel cell anode;**

(2) electrical current generating system which has a gas source containing hydrogen, at least one adsorption module which partially purifies the gas, and at least one **fuel cell** defining an **anode** inlet for receiving purified gas stream from the adsorption module;

(3) system for supplying hydrogen gas to **fuel cell anode** which has hydrogen gas generating system having outlet for discharging gas containing hydrogen and contaminants, respective contaminant separation zones, and **fuel cell anodes** which is attached to the outlet of contaminant (B) separation zone; and

(4) process for providing gas stream containing hydrogen and oxygen-enriched gas stream to **fuel cell** which involves introducing the oxygen-enriched gas stream and purified hydrogen gas stream into **fuel cell,** introducing separation exhaust gas stream as fuel into combustion engine for driving devices such as compressors, vacuum **pumps** or electric generator.

USE - For providing gas stream containing hydrogen to **fuel cell anode,** used for electric power generation, particularly for vehicle propulsion and for small scale stationary power generation.

ADVANTAGE - Purification of reformate hydrogen, energy-efficient pressure swing adsorption system (PSA) oxygen enrichment, heat recovery from the **fuel cell** stack and from combustion of hydrogen PSA tail gas, and thermal powering of air compression for the oxygen PSA and of any PSA vacuum **pumping** are performed so as to minimize the size of the

fuel cell stack while maximizing overall energetic efficiency of energy conversion from the raw fuel. The hydrogen gas delivery system supplies purified hydrogen gas to the **anode** gas inlet, and **recirculate** hydrogen gas from **anode** gas exit back to **anode** gas inlet with increased purity so as to avoid accumulation of impurities in the **anode** channel. Even when high hydrogen purity is specified for the PSA, a small bleed from the end of the **anode** channel back to the feed pressurization step of the hydrogen PSA is avoided. The accumulation of contaminant due to equipment imperfections or operational transient upsets, is eliminated.

DESCRIPTION OF DRAWING(S) - The figure shows an axial section of the rotary pressure swing adsorption systems module.

PSA module 1

Dwg.1/9

TECH WO 200235623 A2UPTX: 20020717

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Adsorbent: The adsorbents (A,B) comprise a carbon monoxide-selective adsorbent which is selected from Na-LSX, Ca-LSX, Li-LSX, Li-exchanged chabazite, Ca-exchanged chabazite, Sr-exchanged chabazite, material containing Cu(I) and material containing Ag(I). The adsorbent (A or B) comprises zeolite, activated charcoal or material containing Cu(I). The adsorption module comprises at least one additional adsorbent which is rotary pressure swing adsorption module (1). The adsorbent (A) preferentially adsorbs carbon dioxide compared to water vapor. The adsorbent (A) comprises an alkali-promoted material and at least one of steam reforming catalyst or a methane steam reforming catalyst. The steam reforming catalyst is selected from methanol or methane steam reforming catalyst. The steam reforming catalyst or water gas shift reaction catalyst is selected from copper-zinc oxide catalyst, transition metal carbonyl complex catalyst, or catalyst of transition group metal inserted into zeolite cage.

Preferred Process: Especially the feed stream comprising water vapor and carbon monoxide as contaminants is produced from a reforming or partial oxidation system (as gas source containing hydrogen). The feed gas stream is introduced into the adsorption module at 80-200degreesC. The water vapor in the feed stream is separated by a first separation zone which is desiccant, and the carbon monoxide in the feed stream is separated by a second separation zone which is zeolite. The water vapor and the carbon monoxide are separated by adsorption through adsorbent beds. The carbon dioxide contained in the feed stream is separated by adsorption using zeolite. The contaminants such as carbon monoxide and water vapor are reacted. The purified hydrogen gas stream is introduced into **anode** of **fuel cell** which is a polymer electrolyte membrane **fuel cell**. The reformer or partial oxidation reactor comprises burner for receiving exhaust gas from

adsorption module, and burner for receiving hydrocarbon fuel. A portion of purified hydrogen gas stream is mixed with separation exhaust gas stream. The **fuel cell** produces
cathode exhaust gas stream containing water. The combustion engine is cooled using the water. The coolant water from the engine is vaporized, and obtained water vapor is introduced into reformer that produces gas feed stream containing hydrogen. The hydrogen gas generating system is heated with engine exhaust gas stream produced from the combustion engine. The liquid water and hydrocarbon fuel stream (methanol and/or ethanol) are mixed to form a coolant mixture which is introduced into coolant jacket juxtaposed with combustion engine. The coolant mixture is vaporized by flash evaporation to form steam-fuel vapor mixture. The obtained mixture is reacted to form gas stream containing hydrogen, and the gas stream is introduced into adsorption module. Portion(s) of cathode water vapor in cathode exhaust gas stream discharged from outlet of the cathode, is condensed. The liquid water stream is separated from cathode exhaust gas stream. The liquid water stream is mixed with hydrocarbon fuel stream.

KW [1] 97153-0-0-0 CL USE
FS CPI EPI GMPI
FA AB; GI; DCN
MC CPI: E31-A03; J01-E03D; J01-E03E; J04-E01; L03-E04
EPI: X16-C15
DRN 1532-U
CMC UPB 20020717
M3 *01* C101 C550 C810 M411 M424 M740 M781 M904 M905 Q413
DCN: R01532-K; R01532-U

L102 ANSWER 7 OF 7 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-090250 [12] WPIX
DNN N2002-066447 DNC C2002-027960
TI **Fuel cell** e.g. for power generation, has **recirculation** conduit between **anode** inlet and outlet, and water separator provided in conduit between **anode** outlet and **pump**, for separating water from fuel gas exiting **anode**.
DC L03 X16 X21
IN CHEN, X; FRANK, D
PA (HYDR-N) HYDROGENICS CORP
CYC 96
PI WO 2001097311 A2 20011220 (200212)* EN 17p H01M008-04
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE
KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO
NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ

```
        VN YU ZA ZW
     CA 2315134      A1 20011213 (200212)  EN          H01M008-04
     AU 2001068867 A  20011224 (200227)               H01M008-04
     US 6541141      B1 20030401 (200324)               H01M008-04
     EP 1328989      A2 20030723 (200350)  EN          H01M008-04
         R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
            NL PT RO SE SI TR
     KR 2003026934 A  20030403 (200353)               H01M008-04
     CN 1447993      A  20031008 (200403)               H01M008-04
     JP 2004503073 W  20040129 (200413)        34p    H01M008-04
ADT  WO 2001097311 A2 WO 2001-CA855 20010613; CA 2315134 A1 CA
     2000-2315134 20000804; AU 2001068867 A AU 2001-68867 20010613; US
     6541141 B1 US 2000-592643 20000613; EP 1328989 A2 EP 2001-947071
     20010613, WO 2001-CA855 20010613; KR 2003026934 A KR 2002-716882
     20021211; CN 1447993 A CN 2001-811065 20010613; JP 2004503073 W WO
     2001-CA855 20010613, JP 2002-511411 20010613
FDT  AU 2001068867 A Based on WO 2001097311; EP 1328989 A2 Based on WO
     2001097311; JP 2004503073 W Based on WO 2001097311
PRAI US 2000-592643    20000613
IC   ICM  H01M008-04
     ICS  H01M008-10
```

AB WO 200197311 A UPAB: 20020221

NOVELTY - **Fuel cell** (42) has electrolyte arranged between an **anode** and cathode, each provided with inlet and outlet. **Recirculation** conduit including **pump** (54) is connected between **anode** inlet and outlet. Water separator (50) is provided in the conduit between **anode** outlet and **pump**, for separating water from fuel gas exiting the **anode**. A fuel inlet (44) is connected to **recirculation** conduit for fuel supply.

DETAILED DESCRIPTION - Fuel is supplied through the **anode** inlet and oxidant is supplied through the cathode inlet.

An INDEPENDENT CLAIM is also included for the method of recovering moisture from a fuel stream of a **fuel cell**.

USE - The **fuel cell** is used for power generation by converting chemical energy to electrical energy for power generation, electric vehicle, etc.

ADVANTAGE - The excess water produced by the **fuel cell** is recovered efficiently and recycled to humidify the oxidant and/or fuel streams, avoiding the need for a separate water source for humidification. The connections of dryers are periodically switched between the cathode inlet and the cathode outlet, where one dryer recovers moisture from outgoing oxidant stream and the other dryer humidifies the incoming oxygen stream. Moisture load on the dryers is reduced, thereby enabling longer cycles to be used. When the oxidant side is maintained at

significantly higher pressure than **anode** or fuel side,
water generated during the reaction is made to flow back through the
membrane so that a significant amount of water appears on
anode side and the exhausted **anode** fuel stream is
significantly humidified. The **fuel cell** can be
used in cold weather conditions, since blockage of vent and
undesirable moisture level are inhibited such that formation of
frost and ice particles in or around the apparatus is prevented. A
replacement of the dryer to effect recharging, is eliminated.
DESCRIPTION OF DRAWING(S) - The figure shows the apparatus for
recovering and **recycling** water on the **anode** side
of **fuel cell** stack.
Fuel cell stack 42
Fuel inlet 44
Water separator 50
Pump 54
Dwg.3/5
ABEX WO 200197311 A2UPTX: 20020221
WIDER DISCLOSURE - A proton exchange membrane is used as the
electrolyte.
FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C01C; X16-C09; X16-C15; X21-A01F; X21-B01A

=> file hca
FILE 'HCA' ENTERED AT 13:17:28 ON 07 APR 2004
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=> d l99 1-8 cbib abs hitind

L99 ANSWER 1 OF 8 HCA COPYRIGHT 2004 ACS on STN
139:166998 Simplified direct oxidation **fuel cell**
system. Ren, Xiaoming; Becerra, Juan J.; Beckmann, Gerhard; Brown,
Eric J.; Defilippis, Michael S.; Neutzler, Jay K.; Gottesfeld,
Shimshon (USA). U.S. Pat. Appl. Publ. US 2003157395 A1 20030821, 17
pp. (English). CODEN: USXXCO. APPLICATION: US 2002-78601
20020219.
AB A simplified direct oxidn. **fuel cell** system is
disclosed. The **fuel cell** is constructed in such
a manner that fuel is added to the cell **anode** as it is
consumed and water is evapd. off at cell cathode so that there is no
need for **recirculation** of unreacted **fuel** at the
cell anode or water at the cell cathode. In

addn., carbon dioxide generated from the **anodic** reaction is passively vented out of the system by using a CO2 gas permeable membrane material integrated as part of the **anode** chamber construction. It is thus possible that, the CO2 sepn. from the **anode** fluid occurs without the **recirculation** of the **anode** fluid outside the **anode** chamber. In one embodiment, the simplified direct oxidn. **fuel cell** includes a gas permeable, liq. impermeable membrane placed in close proximity to the **anode** to perform the carbon dioxide sepn. In accordance with a further aspect of the invention, a fuel container and delivery assembly is provided, which includes sep. conduits from sep. containers for methanol and water and a leakproof interface. This allows for mixing of water into the methanol soln., to allow for improved ability to adjust the concn. of methanol and water in the system. The fuel container and delivery assembly operates using simple mech. flow and simplified geometry. This design minimizes loss of methanol and water via carryover and crossover by limiting introduction of those fluids. The passive system in which fuel is added as it is consumed and CO2 sepd., both without **pumping**, ultimately will increase net power provided to the load due to low parasitic losses.

IC ICM H01M004-94
ICS H01M008-10; H01M008-04

NCL 429044000; 429030000; 429038000; 429042000; 429013000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 38

ST **fuel cell** system simplified direct oxidn

IT Membranes, nonbiological
(CO2-permeable; simplified direct oxidn. **fuel cell** system)

IT **Fuel cells**
(direct methanol; simplified direct oxidn. **fuel cell** system)

IT Polyoxyalkylenes, uses
(fluorine- and sulfo-contg., ionomers; simplified direct oxidn. **fuel cell** system)

IT Fluoropolymers, uses
(polyoxyalkylene-, sulfo-contg., ionomers; simplified direct oxidn. **fuel cell** system)

IT Ionomers
(polyoxyalkylenes, fluorine- and sulfo-contg.; simplified direct oxidn. **fuel cell** system)

IT Fluoropolymers, uses
(simplified direct oxidn. **fuel cell** system)

IT 9002-84-0, Ptfe
(simplified direct oxidn. **fuel cell** system)

IT 124-38-9, Carbon dioxide, processes
(simplified direct oxidn. **fuel cell** system)

IT 67-56-1, Methanol, uses
(simplified direct oxidn. **fuel cell** system)

L99 ANSWER 2 OF 8 HCA COPYRIGHT 2004 ACS on STN
138:404273 **Fuel cell** power plant. Fujita, Tatsuya; Niimi, Yasuhiko; Koto, Takashi; Mizuno, Hideaki (Toyota Motor Corp., Japan). Jpn. Kokai Tokkyo Koho JP 2003151592 A2 20030523, 6 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 2001-343335 20011108.
AB The power plant has H/O **fuel cells**, an **anode** offgas **recycling** pipe, a recycling **pump** on the pipe, a means discharging the **anode** offgas from the **recycling** pipe, and a means controlling the open condition of the discharge means corresponding to the output from the **pump**.
IC ICM H01M008-04
ICS H01M008-10
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** power plant **anode** offgas **recycling** control
IT **Fuel cells**
(power plants; **fuel cell** power plants with **anode** offgas **recycle** controlling means)

L99 ANSWER 3 OF 8 HCA COPYRIGHT 2004 ACS on STN
138:156310 Method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**. Bostaph, Joseph W.; Marshall, Daniel S. (Motorola, Inc., USA). U.S. Pat. Appl. Publ. US 2003031908 A1 20030213, 11 pp. (English). CODEN: USXXCO. APPLICATION: US 2001-925948 20010809.
AB A **fuel cell** device and method of forming the **fuel cell** device are disclosed including a base portion having a major surface. At least one **fuel cell** membrane electrode assembly is formed on the major surface of the base portion. A water recovery and **recirculation** system is defined in a cap portion and in communication with a water recovery and **recirculation** channel defined in the base portion. The water recovery and **recirculating** system is formed to collect reaction water from the cathode side of the at least one **fuel cell** membrane electrode assembly for **recirculation** to the **anode** side of the **fuel cell** membrane electrode assembly. An exhaust sepn. chamber is defined in the base portion and communicating with the **fuel cell** membrane electrode assembly for the exhausting of generated gases.
IC ICM H01M008-04
ICS H01M008-22; H01M008-02
NCL 429030000; 429034000; 029623100

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 47
ST **fuel cell** direct methanol water recovery
recirculation system fabrication
IT Ceramics
(base portion; method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT Glass, uses
Metals, uses
Plastics, uses
(base portion; method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT **Pumps**
(**diaphragm**; method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT Fans
(elec.; method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT Solid state **fuel cells**
(method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT Alloys, uses
(method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT **Pumps**
(piezoelec.; method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT Membranes, nonbiological
(reverse-osmosis; method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT **Pumps**
(rotary, air; method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT 7440-21-3, Silicon, uses
(base portion; method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)
IT 7439-98-7, Molybdenum, uses 7440-02-0, Nickel, uses 7440-05-3, Palladium, uses 7440-06-4, Platinum, uses 7440-18-8, Ruthenium,

uses 7440-57-5, Gold, uses 11130-73-7, Tungsten carbide
(method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)

IT 67-56-1, Methanol, uses
(method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)

IT 7732-18-5P, Water, preparation
(recovery and **recirculation**; method of fabrication of water recovery and **recirculation** system for direct methanol **fuel cell**)

L99 ANSWER 4 OF 8 HCA COPYRIGHT 2004 ACS on STN

138:108072 Fluoro-functional statistical polymers with low glass transition temperature and method for obtaining same. Ameduri, Bruno Michel; Boucher, Mario; Boutevin, Bernard Leon (Hydro-Quebec, Can.). PCT Int. Appl. WO 2003004463 A1 20030116, 102 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (French). CODEN: PIXXD2. APPLICATION: WO 2002-CA1010 20020703. PRIORITY: CA 2001-2352417 20010705.

AB The invention concerns [(CXYCZF)n[CF2CF(RfSO2F)]m]p, wherein X, Y, and Z represent H, F, or CF3, n = 1-20, m = 1-10, p = 5-400, Rf represents one or several CH2CF2, CF2CF(CF3), and(or) CF2CFCl units and exhibiting in particular low glass transition temps. The crosslinkable fluorosulfonated elastomers thus obtained are advantageously usable for making membranes, polymeric electrolytes, ionomers, membranes for **fuel cells** in particular hydrogen or methanol **fuel cells**, for obtaining gaskets and O-rings, rubber hose, pipes, **pump** bodies, **diaphragms**, piston heads (used in aeronautics, oil, automotive, mining and nuclear industries) and for plastics processes (as processing aids). A typical rubber was manufd. by radical polymn. of CF2:CFCF2CF(CF3)SO2F 8.2, hexafluoropropene 13.4, and vinylidene fluoride 15.2 g.

IC ICM C07C309-81
ICS C07C021-18; C08F214-18; C08F214-22; C08F214-24; C08F214-28; C08F228-00; C08F228-02

CC 39-4 (Synthetic Elastomers and Natural Rubber)
Section cross-reference(s): 23

ST sulfonyl fluoride group contg fluoro rubber membrane;

hexafluoropropene vinylidene fluoride perfluoropentenesulfonyl fluoride rubber manuf; plastic processing aid sulfonyl fluoride group contg fluoro rubber; piston head sulfonyl fluoride group contg fluoro rubber; diaphragm sulfonyl fluoride group contg fluoro rubber; pumps sulfonyl fluoride group contg fluoro rubber; pipe sulfonyl fluoride group contg fluoro rubber; hose sulfonyl fluoride group contg fluoro rubber; gasket sulfonyl fluoride group contg fluoro rubber; **fuel cell** sulfonyl fluoride group contg fluoro rubber; ionomer sulfonyl fluoride group contg fluoro rubber; electrolyte sulfonyl fluoride group contg fluoro rubber; telomer sulfonyl fluoride group contg manuf

IT **Fuel cells**
(fluorosulfonyl group-contg. fluoro rubbers with low glass transition temp. and good heat resistance for **fuel cells**)

L99 ANSWER 5 OF 8 HCA COPYRIGHT 2004 ACS on STN
133:337578 Real efficiencies of low power PEM **fuel cell** systems. Slee, Ranulf; Jones, Peter; Lakeman, Barry; Moore, Jon (Electrochemical Power Sources, DERA Haslar, Gosport, PO12 2AG, UK). Proceedings of the Power Sources Conference, 39th, 148-151 (English) 2000. CODEN: PPOCFD. Publisher: National Technical Information Service.

AB A 50 W PEMFC was operated on **pumped** air at 5 psig and pure hydrogen was also supplied at 5 psig from a compressed bottle. The **fuel cell** was operated at 5, 10, 20, 30, 40 and 50 W at room temp. The system used a **diaphragm** air **pump** run continuously, but at variable speed, and an **anode** purge of fixed interval and duration. The vol. of gas used for purging was measured over a measured period for each **fuel cell** output power. The amt. of energy wasted in the hydrogen purge was estd. and related to the **fuel cell** output. The efficiency of hydrogen utilization at 5, 10, 20, 30, 40 and 50 W output power was found to be 58, 75, 88, 93, 94 and 95%, resp. Clearly there is a need to develop an alternative strategy for water management at the **anode.** The beneficial effect of controlling the humidity at the **anode** by a closed-loop hydrogen **recirculation** system is reported. This technique was found to result in a significant redn. in water flooding and the requirement to purge. Alternative purging control logic to the simple timed purge is also proposed.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72

ST polymer electrolyte **fuel cell** efficiency; water management **anode fuel cell**

IT **Fuel cells**
(polymer electrolyte; real efficiencies of low power PEM **fuel cell** systems)

L99 ANSWER 6 OF 8 HCA COPYRIGHT 2004 ACS on STN
127:280824 Gas circulating pump systems for **fuel cells**
. Tani, Toshihiro; Kudome, Osao (Mitsubishi Heavy Industries, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 09259912 A2 19971003 Heisei, 9 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1996-65987 19960322.

AB The pump systems include a pipe at the off gas outlet of the **fuel cell**, for recycling the off gas to the reaction gas supplying pipe for the **fuel cell**, and a **diaphragm pump** installed on the recycling pipe; where the pump has container having an opening for supplying a pressure control gas, a chamber having off gas inlet and outlet pipes and an open bottom in the container, a diaphragm closing the open bottom of the chamber, and a means in the container driving the membrane to suck and discharge the off gas to and from the chamber by vibration. The pump systems may also have a means monitoring the gas pressure in the recycling pipe and a means to control the supplying and discharging of the pressure control gas depending the monitored gas pressure.

IC ICM H01M008-04
ICS F04B043-02; H01M008-12

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** off gas recycling pump; **diaphragm pump fuel cell** off gas

IT **Pumps**
(**diaphragm**; structure of **diaphragm pump** for recycling off gas in **fuel cells**)

IT **Fuel cells**
(structure of **diaphragm pump** for recycling off gas in **fuel cells**)

L99 ANSWER 7 OF 8 HCA COPYRIGHT 2004 ACS on STN
125:119540 Hollow artery anode wick for passive variable-pressure regenerative **fuel cells**. Sprouse, Kenneth M.; Navratil, James D. (Rockwell International Corp., USA). U.S. US 5534363 A 19960709, 9 pp. (English). CODEN: USXXAM. APPLICATION: US 1994-215547 19940322.

AB An anode wick for use with electrochem. **fuel cells** establishes a phys. connection between a **fuel-cell** anode membrane surface and a liq. H2O reservoir. Wicking action substantially ensures the cell anode surface is continually bathed in H2O. Two mech. check valves are incorporated to effectively prevent mixing of H and O in the event the **fuel-cell** system H2O tanks become overpressurized. This design can effectively eliminate the need for some of a conventional

fuel-cell system **pumps** and/or
compressors. Advantageously, the invention also decreases the
overall wt. and mech. complexity of the **fuel-cell**
system, thereby improving system reliability.
IC ICM H01M008-04
NCL 429034000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell anode** wick pressure
regenerative
IT **Fuel cells**
(lightwt. reliable system of)
IT Anodes
(**fuel-cell**, hollow artery wick for passive
variable-pressure regenerative)

L99 ANSWER 8 OF 8 HCA COPYRIGHT 2004 ACS on STN
107:137757 **Fuel-cell** power plants. Amano, Yoshiaki;
Hanzawa, Akio (Hitachi, Ltd., Japan). Jpn. Kokai Tokkyo Koho JP
62170171 A2 19870727 Showa, 5 pp. (Japanese). CODEN: JKXXAF.
APPLICATION: JP 1986-10141 19860122.
AB A **fuel-cell** power plant has a H purifier
installed between a fuel reformer and the anodes of the **fuel
cell**. Waste gas sepd. from H is supplied to the burner of
the reformer, and exhaust from the **anodes** is
recycled by a circulating **pump** to the anodes.
Power plants of this structure have high efficiency, fast
load-output response, and the **fuel cells** have
long lifetime.
IC ICM H01M008-06
ICS H01M008-04
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST power plant **fuel cell; fuel
cell** hydrogen purifn
IT **Fuel cells**
(power plants, high efficiency, with hydrogen purifiers)

=> d l100 1-10 cbib abs hitind

L100 ANSWER 1 OF 10 HCA COPYRIGHT 2004 ACS on STN
138:156321 **Fuel cell** generating system with waste
heat **recirculating** and cooling system. Yang, Jefferson Y.
S. (Asia Pacific Fuel Cell Technologies, Ltd., Taiwan). Eur. Pat.
Appl. EP 1284515 A2 20030219, 10 pp. DESIGNATED STATES: R: AT, BE,
CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT,
LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, SK. (English). CODEN:
EPXXDW. APPLICATION: EP 2002-14821 20020703. PRIORITY: CN
2001-124225 20010816.

AB A generating system for a **fuel cell**, and heat waste **recirculating** and cooling system of the generating system, comprises: a water tank for temporarily storing hot water generated by the **fuel cell**, a heat exchanger in thermal conductive communication with an **anode** gas supply, and a **pump** for **pumping** the hot water to the heat exchanger, whereby heat energy of the hot water is used to heat the **anode** gas supply for releasing **anode** gas, wherein water upon releasing the heat energy is transported back to the **fuel cell** to reduce the temp. of the **fuel cell**, thereby forming a heat waste **recirculation**.

IC ICM H01M008-04

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 47

ST **fuel cell** power plant waste heat **recirculation**

IT Coolants
Cooling apparatus
Fuel cells
Heat exchangers
Pumps
Radiators
Waste heat
(**fuel cell** generating system with waste heat **recirculating** and cooling system)

IT Hydrides
(**fuel cell** generating system with waste heat **recirculating** and cooling system)

IT **Fuel cells**
(power plants; **fuel cell** generating system with waste heat **recirculating** and cooling system)

L100 ANSWER 2 OF 10 HCA COPYRIGHT 2004 ACS on STN

136:40247 Water recovery in the **anode** side of a proton exchange membrane **fuel cell**. Frank, David; Chen, Xuesong (Hydrogenics Corporation, Can.). PCT Int. Appl. WO 2001097311 A2 20011220, 17 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2001-CA855 20010613. PRIORITY: US 2000-592643 20000613.

AB A **fuel cell** has a proton exchange membrane. In known manner, the **fuel cell** includes inlets and

outlets for flow of an oxidant and for flow of a fuel gas, commonly hydrogen. To deal with the issue of humidification, the invention provides a **recirculation** conduit including a **pump** connected between the **anode** inlet and the **anode** outlet. A water separator is provided in the **recirculation** conduit, for sepg. water from fuel gas exiting the **anode.** A main fuel inlet is connected to the **recirculation** conduit, for supply of fuel. A branch conduit can be provided, to enable purge cycles and other options to be provided.

IC ICM H01M008-04

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell anode** side water recovery

IT **Fuel cell anodes**
Membranes, nonbiological
Solid state **fuel cells**
(water recovery in **anode** side of proton exchange membrane **fuel cell**)

IT 1333-74-0, Hydrogen, uses
(water recovery in **anode** side of proton exchange membrane **fuel cell**)

L100 ANSWER 3 OF 10 HCA COPYRIGHT 2004 ACS on STN

133:311832 Mains-independent portable power generation system without pollutant emission, and method for producing electric current using same. Rohland, Bernd; Scholta, Joachim; Jorissen, Ludwig; Zettisch, Georg; Steinhart, Klaus; Roser, Jochen (Zentrum fur Sonnenenergie- und Wasserstoff-Forschung Baden-Wurttemberg, Gemeinnuetzige Stiftung, Germany). PCT Int. Appl. WO 2000063993 A1 20001026, 20 pp. DESIGNATED STATES: W: CA, JP, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE. (German). CODEN: PIXXD2. APPLICATION: WO 2000-DE1282 20000419. PRIORITY: DE 1999-19917826 19990420.

AB The invention relates to a mains-independent portable power generation system without pollutant emission, which comprises: a PEM **fuel cell** unit; a hydrogen storage facility; a line for supplying hydrogen from the storage facility to the **anode** chamber; a line and a **pump** for **recirculating** unreacted hydrogen from the **anode** chamber outlet to the **anode** chamber input; a line and a **pump** for supplying air to the cathode chamber; a line for discharging cathode gas contg. water vapor; a heat exchanger which encloses the storage facility; a coolant circuit with a **pump** between the heat exchanger and **fuel cell** unit; a device for withdrawing current being generated; and a control/regulating unit for controlling/regulating the hydrogen **recirculation**, air supply and coolant circuit in accordance with the setpoint cell voltage and setpoint cell temp. The invention also relates to a method of producing elec. current using

the above power generation system.
IC ICM H01M008-06
ICS H01M008-00
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
IT Electric generators
Fuel cells
(mains-independent portable power generation system without pollutant emission, and method for producing elec. current using same)

L100 ANSWER 4 OF 10 HCA COPYRIGHT 2004 ACS on STN
132:154467 Ambient pressure **fuel cell** system.
Wilson, Mahlon S. (The Regents of the University of California, USA). PCT Int. Appl. WO 2000011745 A1 20000302, 28 pp. DESIGNATED STATES: W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1999-US17573 19990803. PRIORITY: US 1998-135965 19980818.
AB An ambient pressure **fuel cell** system is provided with a **fuel cell** stack formed from a plurality of **fuel cells** having membrane/electrode assemblies (MEAs) that are hydrated with liq. water and bipolar plates with **anode** and cathode sides for distributing hydrogen fuel gas and water to a first side of each one of the MEAs and air with reactant oxygen gas to a second side of each one of the MEAs. A **pump** supplies liq. water to the **fuel cells**. A **recirculating** system may be used to return unused hydrogen fuel gas to the stack. A near-ambient pressure blower blows air through the **fuel cell** stack in excess of reaction stoichiometric amts. to react with the hydrogen fuel gas.
IC ICM H01M008-04
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** system ambient pressure
IT **Fuel cells**
(ambient pressure **fuel cell** system)
IT Epoxy resins, uses
(ambient pressure **fuel cell** system)
IT 7782-42-5, Graphite, uses
(ambient pressure **fuel cell** system)
IT 7782-44-7, Oxygen, reactions
(ambient pressure **fuel cell** system)
IT 1333-74-0, Hydrogen, uses

(ambient pressure **fuel cell** system)

L100 ANSWER 5 OF 10 HCA COPYRIGHT 2004 ACS on STN
122:110655 Solid polymer **fuel cell** stack systems incorporating water removal at the **anode**. Wilkinson, David P.; Voss, Henry H.; Watkins, David S.; Prater, Keith B. (Ballard Power Systems Inc., Can.). U.S. US 5366818 A 19941122, 20 pp. Cont.-in-part of U.S. 5,260,143. (English). CODEN: USXXAM. APPLICATION: US 1992-970614 19921103. PRIORITY: US 1991-641601 19910115.

AB A solid polymer **fuel cell** system removes a substantial portion of water accumulated at the cathode in the outlet fuel stream of the **anode**. The system permits the operation of a H/O **fuel cell** in a dead-ended mode where substantially pure O is employed as the oxidant supply or using low O stoichiometry where a dil. oxidant source, such as O-contg. air, is employed as the oxidant supply. The system thereby eliminates the need for an O **recirculation pump** in systems operating on substantially pure O, and substantially reduces the parasitic load to pressurize the oxidant stream in systems operating on dil. oxidant streams.

IC ICM H01M008-00
ICS H01M008-04; H01M008-10

NCL 429013000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** stack hydrogen oxygen

IT **Fuel cells**
(hydrogen/oxygen; solid polymer **fuel cell** stack systems incorporating water removal at the **anode**)

L100 ANSWER 6 OF 10 HCA COPYRIGHT 2004 ACS on STN
121:13986 Solid polymer **fuel-cell** systems incorporating water removal at **anode**. Wilkinson, David P.; Voss, Henry H.; Watkins, David S.; Prater, Keith B. (Ballard Power Systems Inc., Can.). PCT Int. Appl. WO 9410716 A1 19940511, 76 pp. DESIGNATED STATES: W: AT, AU, BB, BG, BR, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, DE, DK, ES, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG. (English). CODEN: PIXXD2. APPLICATION: WO 1993-US10333 19931028. PRIORITY: US 1992-970614 19921103.

AB The title power-generation systems remove a substantial portion of H_2O accumulated at the cathode in the outlet fuel stream of the **anode**. The system permits the operation of a H-O **fuel cell** in a dead-ended mode where substantially pure O is employed as the oxidant supply or using low O stoichiometry where a dil. oxidant source, such as air, is used as the oxidant supply. The supply system eliminates the need for an O

recirculation pump in systems operating on
substantially pure O, and substantially decreases the parasitic load
to pressurize the oxidant stream in systems operating on dil.
oxidant streams.

IC ICM H01M008-00
ICS H01M008-04; H01M008-10; H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST solid polymer **fuel cell** system; water removal
fuel cell system
IT **Fuel cells**
(hydrogen-oxygen, solid polymer, systems incorporating water
removal)
IT 7732-18-5, Water, miscellaneous
(hydrogen-oxygen solid polymer **fuel-cell**
systems incorporating removal of, at **anode**)

L100 ANSWER 7 OF 10 HCA COPYRIGHT 2004 ACS on STN
90:140149 **Fuel cell** power plant. Sederquist,
Richard A. (United Technologies Corp., USA). U.S. US 4128700
19781205, 9 pp. (English). CODEN: USXXAM. APPLICATION: US
1977-855118 19771126.

AB In a **fuel-cell** power plant the **anode**
and cathode exhausts are combined and burned in a burner with a 1st
portion of the burner exhaust being delivered into fuel conditioning
app. to provide the heat for converting a carbonaceous fuel to H.
The H is then fed to the **anode** side of the **fuel
cells**. A 2nd portion of the burner exhaust is preferably
used to drive a turbocharger for compressing the **fuel-
cell** oxidant which is usually air. If the **fuel
cells** do not operate on pressurized reactants, then the
energy in the 2nd portion of the burner exhaust can be used for any
other suitable purpose. Thus, an exemplary embodiment of the
invention is presented. The power plant shown schematically
includes a **fuel-cell** stack, a turbocharger, a
burner, a fuel reactor, a shift converter, a **recirculation
pump**, and heat exchangers.

IC H01M008-06
NCL 429017000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** power plant
IT Power
(plant, **fuel-cell**)
IT **Fuel cells**
(power plant)

L100 ANSWER 8 OF 10 HCA COPYRIGHT 2004 ACS on STN
72:106578 Electrode with a hydrophobic electrolyte surface. Baker,
Michael Peter; Demoully, Thomas R. (General Electric Co.). Ger.

Offen. DE 1931977 19700226, 28 pp. (German). CODEN: GWXXBX.
PRIORITY: US 19680625.

AB An app. for impregnating carriers with catalytically active material consists of a flask, a vacuum **pump**, a **recirculating pump**, and a filter funnel provided with a perforated plate. The electronically conductive carrier having porosity of 25-90%, pore size (1-15) + 10-3 mm, and thickness 10 times greater than the pore diam. is placed on the perforated plate, and a dispersion contg. the active material (particle size <0.1 + 10-3 mm) is recycled while maintaining the pressure in the flask at 0.5-0.9 atm. After compression, the carrier on the electrolyte side is impregnated with linear hydrophobic polymers having a crit. surface tension <32 dynes/cm. The carrier is placed on a substrate maintained at 232-344° and the polyme r is sprayed on the other surface at a rate less than the penetration rate of the liq. The total wt. of the hydrophobic agent should be 1-7% of the total structure. Thus, porous Ni substrate having pore size of 12.5 + 10-3 mm and porosity of 81% is impregnated with 2.6 mg/cm2 of a mixt. of 31% Pd black and 69% Pt black while maintaining the pressure in the flask at 635 mm Hg. After drying for 1 hr at 110°, the structure is compressed by 39% at room temp. The electrode on the electrolyte side is sprayed with 3.8% Teflon-30 soln . while the other side is maintained at 232°. The electrode having a coating of 2.30 mg/cm2 is heated for 10 min at 340° and then coated with 1.11 mg/cm2 on the other side resulting in total coat ing thickness of 3.41 mg/cm2. A cell contg. the prepd. electrode, Mg **anode** , and 7% NaCl electrolyte h as an initial voltage of 1.11 V at 40 A/ft2 and 1.01 V at the same c.d. after 25 days.

IC H01M

CC 77 (Electrochemistry)

IT **Fuel cells**
(cathodes, nickel, with palladium-platinum catalysts)

IT Cathodes
(**fuel-cell**, nickel, with palladium-platinum catalysts)

IT 7440-05-3, uses and miscellaneous 7440-06-4, uses and miscellaneous
(catalysts, for **fuel-cell** cathodes)

L100 ANSWER 9 OF 10 HCA COPYRIGHT 2004 ACS on STN

70:92656 Air/operated electrolytic cell. Moulton, David M. (Prototech Inc.). U.S. US 3433675 19690318, 3 pp. (English). CODEN: USXXAM. APPLICATION: US 1965-435130 19650225.

AB The design is modified of a **fuel cell** consisting of a Ag-Pd tubular **anode**, Ni cathode provided with 2 end-communicating chambers for an acid or alk. electrolytic medium maintained at 300-700°. The electrolyte is circulated into

the cathode chambers by introducing air into the chambers. The air is passed through CO2-remover cartridge contg. CaO and through a heat exchanger. Part of the exhaust air is recycled by another **pump** and part of it is passed through the heat exchanger to heat the incoming air. Thus, 1500-w. elec. output cell requiring 2115 amp. at 0.71 v. and a stoichiometric air rate of 35.1 l./min. contg. 0.021 g. CO2/min. will require 0.026 g. CaO/min. and yield 72 cal./min. of heat; at 5 times excess air, it will require 0.13 g. CaO/min. and yield 360 cal./min. of heat by applying the described **recirculating** method.

IC H01M

NCL 136086000

CC 77 (Electrochemistry)

ST air operated electrolytic cells; electrolytic cells air operated; **fuel cells** air operated

IT **Fuel cells**
(air-operated)

L100 ANSWER 10 OF 10 HCA COPYRIGHT 2004 ACS on STN

67:87121 A new **fuel-cell** concept. Warszawski, Bernard Entropie, No. 14, 33-45 (French) 1967. CODEN: ENTPA5. ISSN: 0013-9084.

AB The usual form of assocg. 2 chem. regenerators to the electrochem. cell proper is retained. The elementary cell is divided into 2 half-cells sepd. by a semipermeable membrane and there are 2 nonporous, grid-like electrodes, each 0.55-mm. thick and made of plastic charged with carbon or graphite powder. An electrolytic soln. goes through each half-cell lengthwise along the electrode; both solns. flow in parallel, each carrying its own reagent. The whole area of the electrode is thus a reaction zone; the movement of the reagents is by forced convection only; thus, if the buffer has a proper concn. with respect to the reagent concn., no pH polarization can occur; the narrow electrolytic compartment allows poorly conductive electrolytes to be used. It is preferable to operate with a const. inlet reagent concn. (then the outlet concn. is const. and can be made very small) and to adjust the flow of electrolyte to the load. The absence of natural convection insures that there is no rehomogenization of the soln. in its compartment. By making the outlet concn. of the **anodic** compartment very small and by mixing the outlet **anodic** and cathodic electrolytes, a single electrolyte is obtained which can be **recirculated** to the inlets of the cell. This mixing cycle assures the rehomogeneization of the electrolytes. When the elementary cells are in series, the electrolytic continuity in the microchannels is ruptured by gaseous bubbles brought about by the start of the electrolysis of the shunting liquid, and this prevents the shunt currents from growing as fast as theory would indicate. It is possible to use a gaseous reagent, because a gas-electrolyte mixt.

flows through the cell without trouble and with min. **pumping** power. In addn. to the usual catalysts, those that are destroyed in strong alk. media (e.g., redox catalysts of the oxide systems or metallic salts) can be used. The catalysts are free of any poisoning mechanism that would affect phys.-type catalysts. When the catalyst is formed via a chem. or electrochem. technique, the damaged catalyst can be reformed without taking the cell apart by passing a suitable soln. through the cell. Reaction products are eliminated by decantation of the outlet mixt. if they are gaseous and by an overflow system if they are sol. in the electrolyte. Since the pH of the electrolyte in the **anodic** compartment can be made very low, the decarbonation of basic electrolytes is "natural"; any carbonic acid present in the electrolyte will go out as a gas when the pH of the **anodic** soln. reaches 9-10. A typical battery contains 180 elements assembled in a press-filter structure, has a vol. of 2 dm.3, and gives 1.6-2 kw. at usual temps. with reducing agents such as hydrazine and oxidants such as H2O2.

CC 77 (Electrochemistry)
ST **FUEL CELL**
IT **Fuel cells**

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L106 ANSWER 1 OF 7 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2003-132917 JAPIO
TITLE: HYDROGEN PURGED MOTOR FOR **ANODE RE-CIRCULATION** BLOWER
INVENTOR: SIEPIERSKI JAMES S; DUMKE ULRICH
PATENT ASSIGNEE(S): GENERAL MOTORS CORP <GM>
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2003132917	A	20030509	Heisei	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 2002-309657 20021024
ORIGINAL: JP2002309657 Heisei
PRIORITY APPLN. INFO.: US 2001-3869 20011024

SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2003

AN 2003-132917 JAPIO

AB PROBLEM TO BE SOLVED: To disclose a **fuel cell** system that can be used to power a vehicle.
SOLUTION: This system includes a **fuel cell** stack (12), which uses hydrogen and an oxidizer to generate electricity and a re-circulation loop (118) that returns unreacted hydrogen to the **fuel cell** stack. The system includes a hermetically sealed assembly (112) having a blower portion (116) that pressurizes hydrogen in the re-circulation loop and a motor portion (114) that drives the blower. The system also includes a source (60) of make-up hydrogen for replenishing hydrogen in the re-circulation loop. The source of hydrogen introduces make-up hydrogen in the motor portion of the assembly at a pressure greater than the pressure in the blower portion of the assembly. Consequently, make-up hydrogen flows from the motor portion of the assembly into the blower portion of the assembly where it mixes with components in the re-circulation loop. A method of replenishing hydrogen in the **fuel cell** stack is also disclosed.
COPYRIGHT: (C)2003,JPO

IC ICM H01M008-04

L106 ANSWER 2 OF 7 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 2002-352831 JAPIO
TITLE: **ANODE** FLOW **RECIRCULATION** SYSTEM FOR **FUEL CELL**
INVENTOR: YANG JEFFERSON YS
PATENT ASSIGNEE(S): ASIA PACIFIC FUEL CELL TECHNOLOGIES LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2002352831	A	20021206	Heisei	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 2002-113266 20020416
ORIGINAL: JP2002113266 Heisei
PRIORITY APPLN. INFO.: TW 2001-109035 20010416
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2002

AN 2002-352831 JAPIO

AB PROBLEM TO BE SOLVED: To improve the power generation efficiency of a **fuel cell.**
SOLUTION: An **anode** flow **recirculation** system for the power cell comprises an anode gas supply source, a switch, a control device which properly controls the amount of anode gas to be

supplied, a sensor which detects the pressure of anode gas released from the **fuel cell** and is connected to the switch for controlling release/closure, and a humidifier for adjusting humidity of the anode gas released from the **fuel cell**. The released anode gas is, after adjusted for humidity, directed again toward an anode gas feeding opening of the **fuel cell**, to form **recirculation** of the **anode** gas.

IC ICM H01M008-04
ICS H01M008-10

L106 ANSWER 3 OF 7 JAPIO (C) 2004 JPO on STN

ACCESSION NUMBER: 2000-331698 JAPIO
TITLE: **FUEL CELL** GENERATING DEVICE USING GAS TURBINE EXHAUST GAS
INVENTOR: TAKEI MOTO
PATENT ASSIGNEE(S): ISHIKAWAJIMA HARIMA HEAVY IND CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 2000331698	A	20001130	Heisei	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 1999-138606 19990519
ORIGINAL: JP11138606 Heisei
PRIORITY APPLN. INFO.: JP 1999-138606 19990519
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2000

AN 2000-331698 JAPIO

AB PROBLEM TO BE SOLVED: To improve fuel utilization factor of a **fuel cell**.

SOLUTION: This **fuel cell** generating device comprises: a **fuel cell** 10 consisting of an anode and a cathode and generating electric power with oxygen- containing cathode gas and hydrogen-containing anode gas; a combustor 12 for burning cathode exhaust gas from the cathode and anode exhaust gas from the anode; a reformer 11 for reforming steam-containing fuel gas from a fuel gas line 20 with combustion exhaust gas from this combustor 12, so as to produce and supply the anode gas to the anode; and a gaseous carbon dioxide recycling line 22 for circulating the combustion exhaust gas being supplied to this reformer 11 to the cathode. In this case, the device is provided with a gas turbine exhaust gas line 7 for supply exhaust gas from a gas turbine 1 to the cathode, and an **anode** exhaust gas **recirculation** line 25 for recirculating a part of the anode exhaust gas to the fuel gas line 20.

IC ICM H01M008-04

L106 ANSWER 4 OF 7 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1999-233129 JAPIO
TITLE: SOLID ELECTROLYTE **FUEL CELL** GENERATING SYSTEM
INVENTOR: NAGAYASU HIROTSUGU; MIYAMOTO HITOSHI; IKEMOTO YASUHIKO
PATENT ASSIGNEE(S): MITSUBISHI HEAVY IND LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 11233129	A	19990827	Heisei	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 1998-34396 19980217
ORIGINAL: JP10034396 Heisei
PRIORITY APPLN. INFO.: JP 1998-34396 19980217
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1999
AN 1999-233129 JAPIO
AB PROBLEM TO BE SOLVED: To permit power generation at high efficiency by causing a part of exhaust gas after generation in a **fuel cell** main body to **recirculate** to the **anode** inlet of a **fuel cell** via a regenerative heat generator and a condenser.
SOLUTION: Air exhaust gas from the cathode outlet 3b of a **fuel cell** and unrecycled **fuel** exhaust gas from the anode outlet 3d of the cell are supplied to a combustor 4 and, after heat exchange at an air-preheating heat exchanger 2, are exhausted as exhaust gas 5. Supply fuel gas is supplied from a fuel gas supply line 10 and mixed with the recycled part of combustion exhaust gas from the anode outlet 3d, and after the mixed fuel gases are introduced into a fuel-heating heat exchanger 12, a part of water is removed therefrom by a condenser 13 and the gases are re-introduced into the fuel-heating heat exchanger 12 by a circulating blower 14. The exhaust gases are further supplied to the anode inlet 3c of the **fuel cell** via a **fuel**-heating combustor 15 to effect power generation. The amount of the fuel gas recycled can be controlled by controlling the rate of flow at the circulating blower.

IC ICM H01M008-04

L106 ANSWER 5 OF 7 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1994-333585 JAPIO

TITLE: METHOD AND DEVICE FOR STARTING **FUEL CELL** GENERATING DEVICE
INVENTOR: YOSHIDA TOSHIAKI
PATENT ASSIGNEE(S): ISHIKAWAJIMA HARIMA HEAVY IND CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 06333585	A	19941202	Heisei	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 1993-145421 19930526
ORIGINAL: JP05145421 Heisei
PRIORITY APPLN. INFO.: JP 1993-145421 19930526
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1994
AN 1994-333585 JAPIO
AB PURPOSE: To heat a line on anode inlet side by the temperature up at starting.
CONSTITUTION: A **fuel cell** I side is separated from a reformer 10 side by cutoff valves 28, 29, 30, 31, 38, so that their temperatures are independently raised. The temperature rise of the cathode 2 of the **fuel cell** is conducted by heating a gas recirculated from the cathode outlet side to the cathode inlet side by a heater 34. The lower stream position of the cutoff valve 30 on the anode 3 inlet side and the upper stream position of the cutoff valve 31 on the anode 3 outlet side are connected to each other by an **anode recirculating** line 41. This line has a recirculating blower 40 so that the recirculated gas is heated by utilizing the heat transmission from the cathode 2 side.

IC ICM H01M008-04

L106 ANSWER 6 OF 7 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1988-168970 JAPIO
TITLE: COOLING DEVICE FOR **FUEL CELL**
INVENTOR: YOSHIDA TOSHIAKI; TOI MASAAKI
PATENT ASSIGNEE(S): ISHIKAWAJIMA HARIMA HEAVY IND CO LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 63168970	A	19880712	Showa	H01M008-04

APPLICATION INFORMATION
STN FORMAT: JP 1987-193 19870106
ORIGINAL: JP62000193 Showa

PRIORITY APPLN. INFO.: JP 1987-193 19870106
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1988
AN 1988-168970 JAPIO
AB PURPOSE: To realize the reduction of the oxidation gas flow for cooling, by furnishing a recirculation line to lead a part of a fuel gas released from an anode to the gas feeding side, and furnishing a cooler at the recirculation line to recirculate and to cool the fuel gas.
CONSTITUTION: At an **anode** 3 side, a **recirculation** line 31 is furnished to recirculate a part of a fuel gas FG released from the anode 3 to the gas feeding side, and on the way of the recirculation line 31, a blower 32 and a cooler for the recirculation purpose are furnished, while more fuel gas responding to the amount of the recirculation fuel gas flow is fed to the anode 3 side. In such a composition, the heating value which is cooled by the cooler at the cathode side conventionally can be cooled by the cooler 33 at the anode side, and in compliance with this the recirculation flow at the cathode 2 side can be reduced.

IC ICM H01M008-04

L106 ANSWER 7 OF 7 JAPIO (C) 2004 JPO on STN
ACCESSION NUMBER: 1984-068181 JAPIO
TITLE: **FUEL CELL** EQUIPMENT
INVENTOR: YAMAGUCHI MASANORI; YASUKAWA SABURO; UOZUMI SHOHEI; IZUMITANI MINORU; MOCHIZUKI TOMIO
PATENT ASSIGNEE(S): HITACHI LTD
PATENT INFORMATION:

PATENT NO	KIND	DATE	ERA	MAIN IPC
JP 59068181	A	19840418	Showa	H01M008-06

APPLICATION INFORMATION
STN FORMAT: JP 1982-178335 19821013
ORIGINAL: JP57178335 Showa
PRIORITY APPLN. INFO.: JP 1982-178335 19821013
SOURCE: PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 1984
AN 1984-068181 JAPIO
AB PURPOSE: To decrease hydrogen utilization to improve cell performance by **recirculating anode** gas of a **fuel cell** to upstream side of a shift convertor.
CONSTITUTION: Fuel flows in a fuel reformer 2 through a pipe 1, and flows in an anode 4 of a **fuel cell** after carbon monoxide which is harmful to the cell is removed with a shift convertor 3, and electric power is generated. Anode waste gas flows

in a fuel reformer outer heating part 5 and is burnt completely, then joins with air from a cell cathode 8, and they flow in a turbine 8 and rotate a compressor 7. Thereby air flows in the cathode 8. Part of waste gas from the **anode** 4 is **recirculated** to upstream part B of the shift convertor 3 from the part A locating before the outer heating part 5. Thereby hydrogen utilization and the amount of carbon monoxide are decreased.

IC ICM H01M008-06

```
=> file wpix
FILE 'WPIX' ENTERED AT 13:18:53 ON 07 APR 2004
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FILE LAST UPDATED:            5 APR 2004      <20040405/UP>
MOST RECENT DERWENT UPDATE:      200423        <200423/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE


=> d l103 1-25 max
```

L103 ANSWER 1 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2004-187148 [18] WPIX
DNN N2004-148887
TI Valve structure for positive displacement **pump** e.g. **diaphragm pump**, has each valve member inclined relative to flow path while abutting valve seat.
DC Q56
PA (SHIN-N) SHINANO KENSHI KK
CYC 1
PI JP 2004060640 A 20040226 (200418)* 14p F04B053-10
ADT JP 2004060640 A JP 2003-24864 20030131
PRAI JP 2002-165665 20020606
IC ICM F04B053-10
ICS F04B043-02
AB JP2004060640 A UPAB: 20040316
NOVELTY - Each valve member (27), which opens or closes a flow path (25) in a valve body (41), is inclined relative to the flow path while abutting a valve seat (43).

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a positive displacement pump.

USE - For use in intake/exhaust of gas e.g. air, or liquid e.g. fuel, blood, in positive displacement **pump** e.g. **diaphragm pump**, which is used in e.g. medical device, **fuel cell**.

ADVANTAGE - Reduces flow path resistance and pressure loss, while raising pump efficiency. Improves response of flow path opening/closing. Achieves to size reduction of **diaphragm pump**, allowing **pump** to be easily mounted on small apparatus e.g. notebook personal computer, or other device e.g. **fuel cell**, medical device.

DESCRIPTION OF DRAWING(S) - The figure is a schematic drawing of a suction valve structure.

Flow path 25
Valve member 27
Valve body 41
Valve seat 43
Stopper 44
Dwg.9/13

FS GMPI
FA AB; GI

L103 ANSWER 2 OF 25 WPIX
AN 2004-101008 [11] WPIX
DNC C2004-041774
TI Fluororubber composition for sealing materials, comprises preset amount of liquid perfluoro compound, compound having hydrosilyl groups, reinforcing filler, and peroxide crosslinking agent having isopropyl monocarbonate group.
DC A14 A25 A88
IN OSAWA, Y
PA (SHIE) SHINETSU CHEM CO LTD; (SHIE) SHINETSU CHEM IND CO LTD; (OSAW-I) OSAWA Y
CYC 33
PI EP 1371678 A1 20031217 (200411)* EN 26p C08G065-336
R: AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LT LU LV MC MK NL PT RO SE SI SK TR
JP 2004010808 A 20040115 (200411) 25p C08L071-00
US 2003232919 A1 20031218 (200411) C08L083-00
ADT EP 1371678 A1 EP 2003-253597 20030606; JP 2004010808 A JP 2002-168138 20020610; US 2003232919 A1 US 2003-457410 20030610
PRAI JP 2002-168138 20020610
IC ICM C08G065-336; C08L071-00; C08L083-00
ICS C08G065-00; C08K003-00; C08K005-14; C08K005-54; C08K005-541; C08L027-12; C08L071-02
AB EP 1371678 A UPAB: 20040213
NOVELTY - Fluororubber composition comprises liquid perfluoro compound (A), and compound (B) which is capable of carrying out addition reaction and comprising at least two hydrosilyl groups in the molecule. The composition further comprises 1-100 weight parts of reinforcing filler, and 0.1-10 weight parts of peroxide crosslinking agent containing isopropyl monocarbonate group in the molecule with respect to compound A.

DETAILED DESCRIPTION - Fluororubber composition comprises liquid perfluoro compound (A), and compound (B) which is capable of carrying out addition reaction and comprising at least two hydrosilyl groups in the molecule. The compound A contains at least 2 alkenyl groups in the molecule, and divalent perfluoroalkylene or perfluoropolyether structure in the backbone structure. The compounds A and B are combined such that the molar ratio of hydrosilyl groups in compound B with respect to alkenyl groups in compound A is 0.1/1-0.99/1, and the compounds are precured in the presence of an addition reaction catalyst to form a precured base. The composition further comprises 1-100 weight parts of reinforcing filler, and 0.1-10 weight parts of peroxide crosslinking agent containing isopropyl monocarbonate group in the molecule with respect to compound A. INDEPENDENT CLAIMS are included for the following:

(1) method for preparation of composition; and

(2) manufacture of fluoro rubber article.

USE - For automobiles, electrical and electronic components, aircraft, machinery, and for

(1) sealing materials, such as gaskets and packing materials;

(2) diaphragm materials such as fuel regular diaphragms, pulsation damper diaphragms, and oil pressure switch diaphragms;

(3) valves such as canister valves and power control valves;

(4) O-rings such as quick connector O-rings and injector O-rings;

(5) seal components, such as oil seals and cylinder head gaskets;

(6) chemical plant rubber portions e.g., **pump diaphragms**;

(7) rubber portions for ink jet printers, semiconductor manufacturing lines, analytical and experimental equipment;

(8) tent coating materials;

(9) sealants;

(10) molded portions;

(11) extruded portions;

(12) copier roll materials;

(13) electrical moisture-proof coatings;

(14) sensor potting materials;

(15) **fuel cell** sealing materials; and

(16) laminate rubber fabrics.

ADVANTAGE - The fluororubber composition has favorable solvent resistance, heat resistance, chemical resistance, and low temperatures properties. The composition has excellent strength and favorable rubber physical properties. The reinforcing filler contained in the composition imparts favorable workability, weather resistance, flame retardance and reduces thermal shrinkage and coefficient of thermal expansion during curing of the composition. The peroxide crosslinking agent suppresses the generation of

decomposed by products, and due to high fluorine contain the composition has low moisture permeability. Since the composition has low surface energy, the composition has excellent parking properties, and favorable water repellency.
Dwg.0/0

TECH EP 1371678 A1 UPTX: 20040213
TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Compounds: The perfluoro compound (A) is compound of formula (1).
CH2=CH=(X)p-(Rf-Q)a-Rf-(X')p-CH=CH2 (1)
X = -CH2, -CH2O, -CH2OCH2-, and -YNR1-CO-;
Y = -CH2- or group of formula (I);
R1b = H or optionally substituted monovalent hydrocarbon;
X' = -CH2, -OCH2, -CH2OCH2-, or -CO-NR1-Y';
Y' = Y;
Rf = divalent perfluoroalkylene or divalent perfluoropolyether;
a = integer which is optionally 0;
p = 0 or 1; and
Q = group of formulae (2,3 or 4).
X,X',p,R1 = same as defined above;
R3 = optionally substituted divalent hydrocarbon group; and
R4 = optionally substituted divalent hydrocarbon which is optionally separated by at least 1 intervening atom chosen from oxygen, nitrogen, silicon, and sulfur atoms, or group of formulae (5 or 6).
R5 = optionally substituted monovalent hydrocarbon; and
R6 = group comprising at least one atom chosen carbon, oxygen, nitrogen, silicon, and sulfur atom in the backbone structure.
Preferred Component: The compound (B) having at least 2 hydrosilyl groups in the molecule is compound of formulae (7 or 8).
Z-CH2CH2-(X)p-Rf-(X')p-CH2CH2-Z (7)
Rf-(X)p-CH2CH2-Z (8)
X,X',p,Rf = same as defined above; and
Z = group of formula (9).
R2 = optionally substituted monovalent hydrocarbon; and
b = 2 or 3.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Filler: The reinforcing filler comprises fumed silica or fumed silica treated with surface treating agent containing silicon in the molecule.

ABEX EP 1371678 A1 UPTX: 20040213
SPECIFIC COMPOUNDS - The peroxide crosslinking agent containing isopropyl monocarbonate group in the molecule is compound of formula (10).
Me = methyl.

FS CPI
FA AB; GI
MC CPI: A04-E10; A08-C05; A08-R01; A12-H08
PLE UPA 20040213

[1.1] 2004; P0500 F- 7A; P0964-R F34 D01; H0124-R; H0395 H0362; M9999 M2073; M9999 M2028; M9999 M2153-R; M9999 M2200; M9999 M2777; M9999 M2813; L9999 L2391; L9999 L2073; K9723; S9999 S1376; S9999 S1434
[1.2] 2004; ND04; Q9999 Q9007; Q9999 Q9018; Q9999 Q9234 Q9212; Q9999 Q9223 Q9212; Q9999 Q7330-R; Q9999 Q7885-R; Q9999 Q7965 Q7885; Q9999 Q7976 Q7885; Q9999 Q8786 Q8775; Q9999 Q7794-R; Q9999 Q9314; Q9999 Q7114-R; Q9999 Q8991; Q9999 Q8617-R Q8606; Q9999 Q8651 Q8606; Q9999 Q7523; Q9999 Q7874; Q9999 Q7410 Q7330; Q9999 Q7818-R; K9892; K9449; K9676-R; K9483-R; K9518 K9483; K9665; B9999 B5083 B4977 B4740; B9999 B4864 B4853 B4740; B9999 B4568-R; B9999 B4626 B4568; B9999 B4682 B4568; B9999 B4580 B4568; B9999 B4728 B4568; B9999 B4091-R B3838 B3747; B9999 B3623 B3554; B9999 B4239; B9999 B3758-R B3747; B9999 B5538 B5505; B9999 B5550 B5505; B9999 B3509 B3485 B3372; B9999 B5390 B5276; N9999 N5970-R
[1.3] 2004; Si 4A S- 6A; H0157
[1.4] 2004; R01694 D00 F20 O- 6A Si 4A; A999 A237; A999 A419
[1.5] 2004; D01 D11 D10 D50 D63 D88 F45; A999 A157-R; A999 A771
[1.6] 2004; F83 Si 4A; A999 A157-R; A999 A771
[1.7] 2004; A999 A146

L103 ANSWER 3 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-778350 [73] WPIX
CR 2004-106887 [11]
DNN N2003-623810 DNC C2003-214158
TI **Fuel cell** system useful for producing electrical energy, comprises direct oxidation **fuel cell** comprising housing surrounding membrane electrode assembly, source of fuel, source of oxygen, and **pump**.
DC L03 X16
IN DEFILIPPIS, M S; BROWN, E J; KIM, H; NEUTZLER, J K
PA (MTIM-N) MTI MICROFUEL CELLS INC; (MECH-N) MECHANICAL TECHNOLOGY INC
CYC 102
PI US 2003165720 A1 20030904 (200373)* 12p H01M008-04
WO 2003077345 A1 20030918 (200373) EN H01M008-10
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT KE LS LU MC MW MZ NL OA PT RO SD SE SI SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SC SD SE SG SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW
ADT US 2003165720 A1 US 2002-90336 20020304; WO 2003077345 A1 WO 2003-US6740 20030304
PRAI US 2002-90336 20020304

IC ICM H01M008-04; H01M008-10

AB US2003165720 A UPAB: 20040213

NOVELTY - A **fuel cell** system comprises a direct oxidation **fuel cell** comprising a housing surrounding a membrane electrode assembly with an **anode** aspect, a cathode aspect, and a protonically conductive electronically non-conductive membrane, a current collector, and a gas-permeable liquid-impermeable membrane; a source of fuel; a source of oxygen; and a **pump**.

DETAILED DESCRIPTION - A **fuel cell** system (15) comprises a direct oxidation **fuel cell** (17) comprising a housing (23) surrounding a membrane electrode assembly (MEA), a current collector on the outside of MEA to collect and conduct electrical current to a load, and a gas-permeable liquid-impermeable membrane disposed on a cathode side outer surface of the current collector, the MEA comprising an **anode** aspect (19), a cathode aspect (21), and a protonically conductive electronically non-conductive membrane (PCM) disposed between the **anode** aspect and the cathode aspect; a source of fuel in communication with the **anode** aspect; a source of oxygen in communication with the cathode aspect, so as to produce electrically generating reactions comprising **anodic** dissociation of a fuel and water mixture to produce carbon dioxide, protons and electrons, and a cathodic combination of protons, electrons and oxygen to produce water; and a **pump** in fluid communication with an area between the PCM and the gas-permeable liquid-permeable membrane, connected to remove excess water produced at the cathode aspect.

INDEPENDENT CLAIMS are also included for:

(a) a method for managing water in a direct oxidation **fuel cell**, comprising providing a direct oxidation **fuel cell** as above; providing fuel to the **anode** aspect of the **fuel cell**; providing oxygen to the cathode aspect of the **fuel cell**; and removing excess water accumulation from an area between the PCM and the gas-permeable liquid-permeable membrane; and

(b) a method of operating a direct oxidation **fuel cell**, comprising providing a direct oxidation **fuel cell** as above; providing fuel to the **anode** aspect of the **fuel cell**; providing oxygen to the cathode aspect of the **fuel cell**; and drawing air to the surface of, into or through the cathode aspect of the MEA.

USE - Useful for producing electrical energy.

ADVANTAGE - The inventive **fuel cell** optimizes the oxygen provided to the cathode and prevents excess water accumulation on the cathode face of the PCM and the cathode diffusion layer of the **fuel cell**. It also allows the **recirculation** of excess to adjust the fuel

concentration within the **fuel cell** system,
enabling the system to carry a more concentrated fuel source.
DESCRIPTION OF DRAWING(S) - The figure shows a cross-section view of the **fuel cell** system.
Fuel cell system 15
Fuel cell 17
Anode aspect 19
Cathode aspect 21
Housing 23
PCM 25
Dwg.2/5

TECH US 2003165720 A1UPTX: 20031112
TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred Component: The MEA comprises an **anode** diffusion layer, a cathode diffusion layer, and a PCM between the **anode** and cathode. The PCM (25) has an **anode** catalyst layer in intimate contact with the **anode** diffusion layer, and a cathode catalyst layer in intimate contact with the cathode diffusion layer. The current collector comprises a wire mesh.
Preferred Condition: The **pump** is driven by, the electricity generated by the **fuel cell**.
Preferred Method: Excess water is removed by a pressure differential created in the area between the PCM and the gas-permeable membrane. The **pump** creates the pressure differential.
Preferred Function: The gas-permeable liquid-impermeable membrane filters the oxygen provided to the cathode aspect.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Component: The cathode catalyst layer comprises platinum. The **anode** catalyst layer comprises a platinum/ruthenium alloy of platinum.

TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Component: The PCM comprises a perfluorocarbon sulfonic acid ionomer. The fuel is organic, preferably a 50% aqueous solution of methanol.

TECHNOLOGY FOCUS - MECHANICAL ENGINEERING - Preferred Component: The **pump** is a piezoelectrically driven **pump**, a mechanical **pump**, or an electro-osmotic **pump**.

FS CPI EPI
FA AB; GI
MC CPI: L03-E04A
EPI: X16-C01; X16-C09

L103 ANSWER 4 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-698731 [67] WPIX
DNN N2003-557985
TI **Fuel cell** stack has collection chamber for water formed during electrochemical reaction in lower **anode**

chamber; collected water has evaporation surface, is used to moisten fuel fed to stack.
DC X16
IN DEHNE, T
PA (GENK) GENERAL MOTORS CORP; (DEHN-I) DEHNE T
CYC 2
PI DE 10304657 A1 20030904 (200367)* 25p H01M008-04
US 2003211374 A1 20031113 (200382) H01M008-04
ADT DE 10304657 A1 DE 2003-10304657 20030205; US 2003211374 A1 US 2003-360995 20030207
PRAI DE 2002-10205327 20020208
IC ICM H01M008-04
ICS H01M008-24
AB DE 10304657 A UPAB: 20031017
NOVELTY - The **fuel cell** stack has several connected **fuel cells** with **anodes,** cathodes and intermediate membranes between two bipolar plates (10). A collection chamber for liquid water formed during the electrochemical reaction is arranged in a lower **anode** chamber. The collected water has an evaporation surface and is used to moisten the fuel fed to the fuel stack.
DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following: a method of operating an inventive device and a **fuel cell** system with an inventive device.
USE - For a **fuel cell** system.
ADVANTAGE - The required moistening of the fuel fed to the **anode** side is ensured, there is no need for a cooling device or heat exchanger between the **recirculation pump** and **fuel cell** stack and **fuel** loss due to the need for fuel circulation in the **anode** flow circuit is minimized.
DESCRIPTION OF DRAWING(S) - The drawing shows a schematic representation of a bipolar plate for a **fuel cell**
bipolar plate 10
lower side of plate 12
plate edge 14
feed openings 20
channel region 22
Dwg.1/17
FS EPI
FA AB; GI
MC EPI: X16-C09

L103 ANSWER 5 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-447508 [42] WPIX
DNN N2003-356857 DNC C2003-118877
TI **Fuel cell** device used as direct methanol **fuel cell** device, has **fuel cell**

membrane electrode assembly, water recovery and recirculating system, fluid supply channel, and exhaust separation chamber.

DC L03 X16
IN BOSTAPH, J W; MARSHALL, D S
PA (MOTI) MOTOROLA INC
CYC 100
PI US 2003031908 A1 20030213 (200342)* 11p H01M008-04
WO 2003015204 A1 20030220 (200345) EN H01M008-04
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG UZ VN YU ZA ZM ZW
ADT US 2003031908 A1 US 2001-925948 20010809; WO 2003015204 A1 WO 2002-US23093 20020718
PRAI US 2001-925948 20010809
IC ICM H01M008-04
ICS H01M008-02; H01M008-10; H01M008-22
AB US2003031908 A UPAB: 20030703

NOVELTY - A **fuel cell** device includes **fuel cell** membrane electrode assembly, water recovery and recirculating system for recovering reaction water from the membrane electrode assembly; fluid supply channel, water recovery and recirculation channel communicating with the water recovery and recirculating system; exhaust separation chamber; and electrical components.

DETAILED DESCRIPTION - A **fuel cell** device (10) includes a base portion (14) formed of a singular body and having a major surface; a **fuel cell** membrane electrode assembly (16) formed on the base portion; water recovery and recirculating system (64) for recovering reaction water from the membrane electrode assembly; a fluid supply channel defined in the base portion and communicating with the **fuel cell** membrane electrode assembly; a water recovery and recirculation channel (53); an exhaust separation chamber (40); and electrical components. The water recovery and recirculation channel is defined in the base portion and communicates with the water recovery and recirculating system. The exhaust separation chamber is spaced from the fluid channel for exhausting gases from the **fuel cell** membrane electrode assembly. All components except for electrical components form a single **fuel cell** system (12). An INDEPENDENT CLAIM is also included for a method for fabricating the above **fuel cell** device.

USE - Used as direct methanol **fuel cell** device.

ADVANTAGE - The inventive device is a semi-self contained

system and is not orientation sensitive, thus providing for ease in moving the system, such as, when providing power to portable electronic device. The design provides for a simplified system in which water generated on the cathode side of the **fuel cell** assembly is collected in a forced air stream and recirculated back to the mixing chamber through the re-circulating channel, thus providing for less consumption and replenishment of a water supply.

DESCRIPTION OF DRAWING(S) - The figure is a sectional view of direct methanol **fuel cell** device.

Fuel cell device 10
Fuel cell system 12
Base portion 14
Fuel cell membrane electrode assembly 16
Electrode 18, 22
Film 20
Cap portion 28
Mixing chamber 36
Exhaust separation chamber 40
Air supplier 50
Water recovery and recirculation channel 53
Gas-liquid separator tank 56
Reverse osmosis type membrane 60
Remaining water 63
Water recovery and recirculating system 64
Dwg.1/3

TECH US 2003031908 A1UPTX: 20030703

TECHNOLOGY FOCUS - MECHANICAL ENGINEERING - Preferred Component: Each of the **fuel cell** membrane electrode assemblies are spaced at 0.01 mm from the adjacent assembly. It includes first electrode (18), a film (20) adjacent the first electrode, conductive electrolyte, and a second electrode (22) contacting with the film. It also includes gas diffusion layer on first and second electrodes. The water recovery and recirculating system includes a gas-liquid separator tank (56) communicating with the forced air stream and the water recovery and recirculating channel and mixing chamber (36). It also includes a reverse osmosis type membrane (60) in communication with the air water separator tank and the water recovery and recirculating channel. The water recovery and recirculating channel provides for the recovery and recirculation from the **fuel cell** back to the mixing chamber, of a remaining water (63) and methanol mixture and reaction water collected from the water recovery and recirculating system. The device may include a cap portion (28) comprising an air supplier (50). The air supplier includes piezoelectric **pump**, **diaphragm pump**, peristolic **pump**, rotary air pump, or an electric fan. Preferred Material: The base portion is ceramic, plastic, glass, metal, or silicon.

FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C09

L103 ANSWER 6 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-221563 [21] WPIX
DNC C2003-056334
TI Statistical fluoro functional elastomeric copolymers, for use in e.g. fabricating ion exchange membranes, polymer electrolytes, seals, tubes, of specific formula are new.
DC A14 A88
IN AMEDURI, B M; BOUCHER, M; BOUTEVIN, B L
PA (HYDR-N) HYDRO-QUEBEC
CYC 100
PI WO 2003004463 A1 20030116 (200321)* FR 101p C07C309-81
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VN YU ZA ZM ZW
CA 2352417 A1 20030105 (200321) FR C07C309-81
ADT WO 2003004463 A1 WO 2002-CA1010 20020703; CA 2352417 A1 CA 2001-2352417 20010705
PRAI CA 2001-2352417 20010705
IC ICM C07C309-81
ICS C07C019-16; C07C021-18; C07C309-80; C08F214-18; C08F214-22; C08F214-24; C08F214-28; C08F228-00; C08F228-02
AB WO2003004463 A UPAB: 20030328
NOVELTY - Statistical fluoro functional copolymers of specified formula are new.
DETAILED DESCRIPTION - Statistical fluoro functional copolymers of formula (V1) or of Formula (VIII) are new.
-(-(CXY-CZF)n-(CF2CF(RFSO2F))m-)p- (V1)
X, Y, Z = H, F, CF3;
n = integer 1-20;
m = 1-10;
p = 5-400;
RF = vinylidene fluoride, hexafluoropropene, chlorotrifluoroethylene
-(-(CH2CF2)a-(CF2CF(CF3))b-(CF2CF(RFSO2F))c-)d- (VIII)
a/b = 1-15;
a/c = 1-25;
d = 10-400
INDEPENDENT CLAIMS are also included for the following:
(1) Telomers of Formula (III);

(2) Use of the telomers as precursors in the preparation of compounds of Formula (II);

(3) A method of preparation of the telomers;

(4) Monomers of Formula (I) or Formula (II);

(5) Preparation of the monomers by transformation of the claimed telomers;

(6) Preparation of the copolymers from (I) or (II) and a compound of Formula (V);

(7) A method of fabrication of ion (preferably cation) exchange membranes comprising various transformations of the copolymers using known techniques;

(8) A method of preparing polymer electrolytes comprising transformation of the copolymers by known techniques;

(9) A method of preparing ionomers comprising transformation of the copolymers by known techniques; and

(10) A method of preparing toroid joints comprising transformation of the copolymers by known techniques.

F2C=CF-RF-SO2F (I)

F2C=CF(CH2CF2)w(CF2CF(CF3))x(CF2CFCl)ySO2F (II)

ClCF2CFCl(CH2CF2)w(CF2CF(CF3))x(CF2CFCl)yI (III)

XYC=CZF (V)

w = 0-10 and preferably 5;

x, y = 0-5 and preferably 1.

USE - The copolymers are used to make membranes, polymer electrolytes, ionomers, hydrogen or methanol **fuel cell** membranes, sealing joints, toroid joints, flexible hoses, pipes, **pump** bodies, **diaphragms**, piston heads and aids for the making of plastic articles (claimed).

ADVANTAGE - The copolymers have good thermal stability because of their low glass transition temperatures.

Dwg.0/0

TECH WO 2003004463 A1UPTX: 20030328

TECHNOLOGY FOCUS - POLYMERS - Preferred Copolymers: The copolymers are preferably of Formula (V1)

X, Y = H;

n = 3-10;

m = 1-5;

p = 10-300

They contain 68-96 % by moles (mol.%) of vinylidene fluoride and 4-32 mol.% of a highly fluorinated, sulfonyl fluoride terminated trifluorovinylic monomer. More preferably the latter is 1,1,3,4,4-pentafluorobut-3- ene-sulfonyl fluoride or 1,1,1,2,3,3,4,5,5-nonafluoropent-4-ene-2-sulfonyl fluoride. They may also be of Formula (VIII).

a/b = 2-10;

a/c = 2-15;

d = 25-250

and contain 54-87 mol.% vinylidene fluoride,1-34 mol.%

hexafluoropropene and 2-12 mol.% of the trifluorovinylic monomers above.
Preferred Fluorinated Groups: Where the trifluorovinylic monomer is 1,1,3,4,4- pentafluorobut-3-ene-sulfonyl fluoride, the copolymer possesses the following fluorinated groups with associated RMN 19F displacements (in ppm):
SOF +45;
CH2CF(CF3)- -70 to -75;
tBuO-CF2CH2 -83;
-CH2CF2CH2CF2-CH2CF2 -91;
CF2CF(RF)- CH2CF2-CH2CF2 -92; CF2CF(RF)-CH2CF2-CH2CF2-CF2CF(RF)- -93; CH2CF2-CH2CF2-CF2CH2- -95; CF2CF(CH2CF2SO2F)-CH2CF2- -105; CF2CF(RFSO2F)-CH2CF2-CF2CF(RF)- -108; CH2CF2-CH2CF2- CF2CF(RF)- -110;
CH2CF2SO2F -112;
CH2CF2-CH2CF2-CF2CH2 -113; CH2CF2-CF2CH2CH2CF2- -116;
CH2CF2-CF2CF(CF3)-CH2CF2- -120; CF2CF(RF-SO2F)-CF2CF(CF3)-CH2CF2- -121; CH2CF2-CF2CF(RFSO2F)- CH2CF2- -122; CH2CF2-CF2CF(RFSO2F)-CF2CH2- -127;
CH2CF2- CF2CF(CH2CF2SO2F)-CH2CF2- -161 to -165; CH2CF2-CF2CF(CF3)- -180 to -185.
Where it is 1,1,1,2,3,3,4,5,5-nonafluoropent-4-ene-2-sulfonyl fluoride, they are as follows: SOF +45;
CH2CF(CF3)- -70 to -75;
CF2CF(CF3)SO2F -75 to -77;
tBuO- CF2CH2 -83;
CH2CF2-CH2CF2-CH2CF2- -91;
CH2CF2-CH2CF2- CF2CH2- -95; CH2CF(RFSO2F)-CH2CF2-CF2CF(RFSO2F)- -108; CH2CF2-CF2CF(RFSO2F) and CH2CF2CF2CF(F3)- -110; CH2CF2-CH2CF2-CF2CH2- -113; CH2CF2-CF2CH2-CH2CF2- -116;
CH2CF2- CH2CF2CF(CF3)- -120; CH2CF2-CF2CF(RFSO2F)-CF2CF(CF3)- -122; CF2CF((CF2CF(CF3)SO2F)-CH2CF2- -125; CH2CF2-CF2CF(RFSO2F)- CF2CH2- -180; CH2CF2-CF2CF(CF3)- -182;
CH2CF2-CF2CF(RFSO2F)- CH2CF2 -205.
Preferred Characteristics: The copolymers are crosslinkable elastomers with a low glass transition temperature (Tg). The Tg measured in accordance with ASTM E-1356- 98 is below 0 degrees C, more preferably -30 to -5 degrees C and most preferably below -20 degrees C. They have thermostability measured by thermogravimetric analysis up to 380 degrees C or more preferably 315 degrees C under air at 10 degrees C per minute at which point a weight loss of 5% is recorded. Preferred Preparation Methods: The copolymer is prepared by reacting compounds (I) or (II) with (V) in a batch emulsion, microemulsion, suspension or solution in the presence of one or more organic radical initiators (preferably peroxide and/or per ester) or persulfates. The reaction is carried out in the presence of t-butyl peroxypivalate at 70-80 degrees C and most preferably at 75 degrees C or in the presence of t-butyl peroxide at 135-145 degrees C and

most preferably at 140 degrees C. The reaction is conducted in the presence of one or more solvents selected from esters of formula R-COO-R', fluorinated solvents, acetone, 1,2-dichloroethane, isopropanol, tertiary butanol, acetonitrile and/or butyronitrile.
R, R' = H, 1-4C alkyl, OH, OR;
R = 1-5C alkyl
and more preferably
R = C, CH3;
R' = CH2, C2H5, I-C3H7, t-C4H9
Most preferably it is perfluoro-n-hexane or acetonitrile. The molar ratio of the initial concentration of initiator to the initial concentration of monomers is 0.1-2 and more preferably 0.5-1. The monomers are prepared by sulfonation, chlorination and fluorination of compounds (III) to give compounds of Formula (IV) ClCF2CFCl-RF-SOF which are then dechlorinated. The telomers are prepared by telomerization or co-telomerization by stages of vinylidene fluoride and/or hexafluoropropene and/or chlorotrifluoroethylene with ClCF2CFCH.
Preferred Crosslinking: The copolymers are crosslinked by contacting with an agent permitting reaction between the sulfonyl groups of adjacent chains and at least a fraction of the crosslinks bear an ionic charge.

ABEX WO 2003004463 A1UPTX: 20030328
EXAMPLE - 1,2-dichloro-1-iodotrifluoroethane was prepared by charging a Carius tube with 175.5g (1.08 mol) iodine monochloride, 1.1g (0.006 mol) benzophenone and 150g of methyl chloride and cooled with a mixture of liquid nitrogen and acetone at -80 degrees C. After 3 vacuum/nitrogen cycles, 131g (1.12 mol) of chlorotrifluoroethylene was introduced. The tube was then sealed and progressively reheated to ambient temperature. The solution was stirred under UV for 6 hours. The result was a pink liquid containing iodine crystals. After distillation 204.9g of pink liquid were obtained. The product contained the isomers 1-iodo-1,2-dichlorotrifluoroethane and 1,1-dichloro-2-iodotrifluoroethane.

FS CPI
FA AB
MC CPI: A01-D; A01-D12; A04-A; A04-E01; A04-E10D; A10-B01; A10-B08; A10-E01; A10-E21B; A12-H00H; A12-M02; A12-M04; A12-W11A
PLE UPA 20030328
[1.1] 018; G0806 G0022 D01 D51 D53 D12 D10 D59 F- 7A F61 D84 D85 D69 Cl D82 D83 D86 D87 D88 D89 D90 D91 D92 D93 D94 D95; H0271; L9999 L2471; L9999 L2835; L9999 L2813
[1.2] 018; ND08; ND03
[2.1] 018; R00363 G0555 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F- 7A; R00976 G0022 D01 D12 D10 D51 D53 D59 D69 D83 F- 7A; R00458 G0022 D01 D12 D10 D53 D51 D59 D69 D82 F- 7A Cl; H0306; L9999 L2686 L2506; L9999 L2528 L2506; K9723; H0000; H0022 H0011; H0033 H0011; L9999 L2391; L9999 L2835; L9999

L2813; M9999 M2835; M9999 M2813; P0555
[2.2] 018; ND04; ND03; B9999 B5094 B4977 B4740
[2.3] 018; F- 7A S- 6A; H0157
[2.4] 018; D01 D11 D10 D50 D82 D69 F- 7A Cl I-; C999 C226; C999 C293
[3.1] 018; G0806 G0022 D01 D51 D53 D12 D10 D59 F- 7A F61 D84 D85 D69 Cl D82 D83 D86 D87 D88 D89 D90 D91 D92 D93 D94 D95; G0022-R D01 D51 D53 D12 D10 D58 D59 D69 F- 7A D82 D83 D84 D85; H0124-R; L9999 L2528 L2506; L9999 L2551 L2506; L9999 L2664 L2506; S9999 S1661; P0588; H0011-R; L9999 L2391; M9999 M2391
[3.2] 018; B9999 B4988-R B4977 B4740; ND04; B9999 B5618 B5572; B9999 B4682 B4568; Q9999 Q8060; Q9999 Q8764; Q9999 Q7410 Q7330; Q9999 Q9018; Q9999 Q8731 Q8719; B9999 B4035 B3930 B3838 B3747; Q9999 Q7976 Q7885; Q9999 Q7965 Q7885; Q9999 Q7885-R; ND03
[3.3] 018; D01 F48 F42 D63 F62; R05079 D01 D11 D10 D50 D63 D89 F42; R00899 D01 D11 D10 D50 D88 F48; C999 C088-R C000; C999 C340; C999 C293
[3.4] 018; D01 D63 F89 F41 F27 F26 F26-R D11 D10 D50 O- 6A D82 D83 D84 D85 D86 D87 D88 D89 D90 F12 F- 7A; R00272 G1525 D01 D11 D10 D50 D83 F23; R00811 G1989 G1978 D01 D11 D10 D50 D69 D82 Cl 7A; R00271 D01 D11 D10 D50 D83 F27 F26; R00342 D01 D11 D10 D50 D82 F12; R00373 G3496 D01 D10 D11 D50 D84 F26 F27; A999 A771; A999 A475

L103 ANSWER 7 OF 25 WPIX
AN 2003-179484 [18] WPIX
DNN N2003-141218
TI Gas pressurizing apparatus for **fuel cell** system, controls reciprocating motion of **diaphragm** of gas **pump** unit, based on measured inlet side gas temperature and pressure.
DC Q56 X16
PA (NAGA-N) NAGANO KEIKI SEISAKUSHO KK
CYC 1
PI JP 2003021071 A 20030124 (200318)* 9p F04B049-06
ADT JP 2003021071 A JP 2001-209309 20010710
PRAI JP 2001-209309 20010710
IC ICM F04B049-06
ICS H01M008-04
AB JP2003021071 A UPAB: 20030317
NOVELTY - A pump unit (11) has a diaphragm (111) which converts rotation of a motor (110) into reciprocating motion to compress gas. A control unit (16) controls number of reciprocating motions of the diaphragm, based on discharge flow amount of the pump unit calculated based on the measured inlet side gas temperature and pressure and the number of reciprocating motions.

USE - For **fuel cell** system used in home, small-scale business and for hot water supply system.

ADVANTAGE - Since use of expensive flow amount sensor and flow regulating valve is unnecessary, it reduces cost reduction of the apparatus and improves energy efficiency of apparatus.

DESCRIPTION OF DRAWING(S) - The figure shows a block diagram of the fuel electricity generator built with gas pressurizing apparatus. (Drawing includes non-English language text).

pump unit 11
control unit 16
motor 110
diaphragm 111
Dwg.1/6

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FS    EPI GMPI
FA    AB; GI
MC    EPI: X16-C09

L103 ANSWER 8 OF 25  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN    2002-608299 [65]   WPIX
DNN   N2002-481740        DNC C2002-171902
TI    Preparation of trifluorovinylic monomers having terminal nitrile
      groups  used in the production of cross-linked fluorosulfonated
      nitrides useful for the preparation of membranes, electrolyte
      polymers and ionomers.
DC    A14 A41 A85 E16 L03 X16
IN    AMEDURI, B; BOUCHER, M; MANSERI, A; AMEDURI, B M
PA    (HYDR-N) HYDRO-QUEBEC
CYC   98
PI    WO 2002050142 A1 20020627 (200265)* FR    53p    C08F214-22
         RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
             MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
          W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
             DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP
             KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ
             NO NZ PH PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG
             US UZ VN YU ZA ZW
      CA 2328433    A1 20020620 (200265)  FR          C07C255-10
      AU 2002013687 A  20020701 (200269)              C08F214-22
      EP 1355962    A1 20031029 (200379)  FR          C08F214-22
          R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
             NL PT RO SE SI TR
ADT   WO 2002050142 A1 WO 2001-CA1439 20011012; CA 2328433 A1 CA
      2000-2328433 20001220; AU 2002013687 A AU 2002-13687 20011012; EP
      1355962 A1 EP 2001-981986 20011012, WO 2001-CA1439 20011012
FDT   AU 2002013687 A Based on WO 2002050142; EP 1355962 A1 Based on WO
      2002050142
PRAI  CA 2000-2328433  20001220
IC    ICM  C07C255-10; C08F214-22
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ICS C08F222-30
AB WO 200250142 A UPAB: 20021010
NOVELTY - Preparation and copolymerization of trifluorovinylic monomers (I) having terminal nitrile groups.
DETAILED DESCRIPTION - Preparation and copolymerization of trifluorovinylic monomers of formula (I).
- Z2C = CWX(CY2)nCN - (I)
X = O or no atom;
Y = H or F;
Z = H or F;
W = H, F or CF3; and
n = 0 - 10.
INDEPENDENT CLAIMS are included for:
(1) preparation of fluorinated copolymer;
(2) cross-linkable fluorosulfonated nitriles; and
(3) cross-linked elastomers and their uses.
USE - The elastomers obtained are used in the construction of membranes, electrolyte polymers, ionomers, and as components of hydrogen or methanol **fuel cells**. They can also be used in sealed joints, **pump** bodies, **diaphragms** and piston heads.
ADVANTAGE - The copolymers of olefin nitriles with PFSO2F and terpolymers including VDF produce new elastomers with very low Tg values, good resistance to acids, oil and fuels and good constructive properties.
Dwg.0/0
TECH WO 200250142 A1UPTX: 20021010
TECHNOLOGY FOCUS - ORGANIC CHEMISTRY - Preferred Trifluorovinylic Monomer (I): The trifluorovinylic monomer is preferably of formula (II)
F2C = CF(CH2)nCN (II)
Preferred Preparation: The preparation of a fluorinated copolymer by radical copolymerization comprises the reaction of a compound of formula (I) with a compound of formula (III1) or a compound of formula (III2)
F2C = CFORF1 (III1)
F2C = CFORF2-G (III2)
RF1 = CnF2n + 1;
n = 1 - 10;
RF2 = (CF2CFX1)y(O(CF2)l)m
X1 = F or CF3;
y, l and m = respectively 1 - 5; 1 - 4; and 0 and 6 inclusive;
G = SO2F, COOH, CO2R or P(O)(OR1);
R = CpH2p + 1;
p = 0 - 5;
R1 = H or 1 - 5C alkyl;
More preferably, the preparation is the reaction of a compound of formula (II1) with compound (III1) or (III2) to obtain a statistical

copolymer of formula (IV).
$F2C = CF(CH2)3CN$ (II1)
RF = RF1 or RF2;
G = absent when RF = RF1 and (when present) is as defined above; and q, r and s = are such that q / r varies from 1 - 30 (preferably 1 - 25), s is 20 - 300 (preferably 25 - 250); more preferably q / r varies from 3 - 20 and s is 30 - 220.
In another variant, the copolymerization comprises the reaction of a compound (II1) with a compound (III1) or a compound (III2) and a compound of formula (V) to give a statistical copolymer of formula (VI).
FCX=CYZ (V)
X, Y and Z = independently H, F, Cl or CnF2n+1; and
n = 1, 2 or 3;
RF = RF1 or RF2;
G = absent when RF = RF1; and
e, f, g and h = are such that f / e varies from 5 - 50 (preferably 10 - 25), f / g varies from 1 - 20 (preferably 2 - 5) and h is 15 - 200 (preferably 20 - 150).
But in no case does X = Y = Z = F.
The copolymerization is preferably carried out in batch, as an emulsion, microemulsion, suspension or solution. The reaction is initiated in the presence of a peroxide, perester, percarbonate, alkyl peroxypivalate or diazoic compound; more preferably t-butyl peroxide, -hydroperoxide, peroxypivalate or t-amyl peroxypivalate and/or benzoyl peroxide and/or t-butyl cyclohexyl peroxydicarbonate. The concentration of peroxide and/or perester and/or percarbonate is such that the initial molar ratio of initiator to monomers is 0.1 - 2%, preferably 0.5 - 1%. In the presence of t-butyl peroxypivalate, the reaction is effected at 70 - 80 degrees C, preferably about 75 degrees C, and with t-butyl peroxide, the temperature is 135-145 degrees C, preferably about 140 degrees C. An organic solvent is used, which is perfluoro-n-hexane, acetonitrile or mixtures of these. The solvent content is such that the mass ratio of solvent to monomers is 0.5 - 1.5, preferably 0.6 - 1.2.
Preferred Components: Formulae (III2) and (V) are, respectively, sulfonyl perfluoro(4-methyl-3,6-dioxaoct-7-ene)fluoride and vinylidine fluoride.
Fluorosulfonated nitrile copolymers obtained comprise (% moles):
(a) 5,6,6-trifluoro-5-hexenenitrile (F-CN) (1 - 20 (preferably 2 - 14));
(b) sulfonyl perfluoro(4-methyl-3,6-dioxaoct-7-ene) fluoride (PFSO2F) (20 - 33 (preferably 20 - 30)); and
(c) vinylidine fluoride(VDF) (65 - 79 (preferably 66 - 78)).
Preferred Preparation of Elastomers: The copolymers obtained above are submitted to a cross-linking process in the presence of tetraphenyl tin or silver oxide, in an amount of 0.1 - 10 parts wt. to 100 parts of fluorosulfonated nitrile copolymer. The mixture is

pressurized to 20 bars at 175 degrees C for 2 hours then 200 degrees C for 24 hours and finally 220 degrees C for 12 hours. The elastomers obtained have very low glass transition points (Tg), preferably -43 to -22 degrees C, more preferably -34 to -29 degrees C. The inherent viscosity (ASTM D-2857-95) is between 0.9 and 2.0 ml/g. The elastomers show a thermostability (thermogravimetric analysis) up to 297 degrees C under air at 10 degrees C/min; a mass loss of 5% is measured at this temperature. The invention also describes a process of cross-linking of the sulfonyl groups of a sulfonated polymer in which the polymer is contacted with a cross-linking agent and a fraction of the bonds formed have an ionic charge.

ABEX WO 200250142 A1UPTX: 20021010
EXAMPLE - Synthesis of fluorosulfonate nitrile elastomers by radical copolymerization: VDF / F2C=CFC3H6CN/CF2=CFOCF2CF(CF3)OC2F4SO2F: CF2=CFC3H6CN (4.6 g (0.03 mol)), CF2=CFOCF2CF(CF3)OC2-F4SO2F (28.4 g (0.062 mole)), tertiobutyl peroxide (0.22 g (1.5 x 10 to the power -3 mole)) and acetonitrile (30 g) were mixed in a 160 ml Hastelloy reactor. The reactor was sealed, evacuated and cooled in acetone/liquid N2 to -80 degrees C. VDF (14 g (0.218 mole)) was then added, the reactor returned to ambient temperature then heated to 135 degrees C for 15 hours. After cooling in ice, the reactor was degassed and 2.8 g of unreacted VDF released. Characterization by NMR 19F showed that 80% of the sulfonated monomer had reacted. The acetonitrile was partially evaporated, then the copolymer was precipitated by dropwise addition in 200 ml of stirred cold pentane. A viscous amber-brown product (38 g) was obtained with a yield of 75%. NMR spectra revealed the presence of 72% molar of VDF, 25% molar of PFSO2F and 3.0% molar of F-CN. The Tg value, by DSC analysis, was found to be -31 degrees C.

KW [1] 571165-0-0-0 CL NEW; 0068-99101 CL NEW
FS CPI EPI
FA AB; GI; DCN
MC CPI: A04-D; A04-E10D; A10-B01; A11-C02A; E10-A15B; L03-E01C3; L03-E04G
EPI: X16-C16; X16-J01A; X16-J08
PLE UPA 20021010
[1.1] 018; G0806 G0022 D01 D51 D53 D12 D10 D58 D59 D69 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93 F12 F- 7A; H0271; L9999 L2471; L9999 L2813
[1.2] 018; ND08
[2.1] 018; H0022 H0011; G0806 G0022 D01 D51 D53 D12 D10 D58 D59 D69 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93 F12 F- 7A; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F- 7A D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93; L9999 L2528 L2506; L9999 L2664 L2506; L9999 L2551 L2506; L9999 L2675 L2506; H0124-R; M9999 M2073; L9999 L2391; L9999 L2073; P0588; S9999 S1661; K9723

[2.2] 018; H0022 H0011; G0806 G0022 D01 D51 D53 D12 D10 D58 D59 D69 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93 F12 F- 7A; G0806 G0022 D01 D51 D53 D11 D10 D12 D59 D60 D63 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93 D69 F36 F35 F89 F41 F62 P- 5A O- 6A S- F- 7A D64; L9999 L2528 L2506; L9999 L2664 L2506; L9999 L2551 L2506; L9999 L2675 L2506; L9999 L2391; L9999 L2073; M9999 M2073; S9999 S1661; H0124-R; P0588; K9723

[2.3] 018; G0806 G0022 D01 D51 D53 D12 D10 D58 D59 D69 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93 F12 F- 7A; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F- 7A D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93; G0806 G0022 D01 D51 D53 D11 D10 D12 D59 D60 D63 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93 D69 F36 F35 F89 F41 F62 P- 5A O- 6A S- F- 7A D64; G0022-R D01 D51 D53 D12 D10 D58 D59 D69 D82 D83 D84 D85 F- 7A Cl; R00363 G0555 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F- 7A; H0033 H0011; L9999 L2528 L2506; L9999 L2664 L2506; L9999 L2551 L2506; L9999 L2675 L2506; H0124-R; M9999 M2073; L9999 L2391; L9999 L2073; P0588; S9999 S1661; K9723; L9999 L2528 L2506; L9999 L2664 L2506; L9999 L2551 L2506; L9999 L2675 L2506; L9999 L2391; L9999 L2073; M9999 M2073; S9999 S1661; H0124-R; P0588; K9723

[2.4] 018; ND01; ND04; B9999 B5618 B5572; B9999 B3678 B3554; B9999 B4682 B4568; Q9999 Q8060; Q9999 Q8764; Q9999 Q7410 Q7330; Q9999 Q9018; Q9999 Q7976 Q7885; Q9999 Q9223 Q9212; Q9999 Q9234 Q9212; Q9999 Q8139 Q8093; Q9999 Q8162

[2.5] 018; D01 D63 F42 F48 F45 D11 D10 D14 D13 D31 D76 D50 D90; R00899 D01 D11 D10 D50 D88 F48; R00389 D01 D11 D10 D50 D84 F48; R05079 D01 D11 D10 D50 D63 D89 F42; R00610 D01 D19 D18 D32 D50 D63 D76 D93 F42; C999 C088-R C000; C999 C293; C999 C340

[2.6] 018; D01 D11 D10 D50 D86 D69 F- 7A; R00342 D01 D11 D10 D50 D82 F12; A999 A475; A999 A771

CMC UPB 20021010
M3 *01* H6 H601 H609 H683 H684 H7 H721 K0 L1 L145 M280 M315 M321 M332 M344 M362 M391 M416 M710 M904 M905 Q010 Q110 Q454 R038 R042 R043 R045
DCN: RA7OKY-N
M3 *02* H581 H601 H607 H608 H609 H682 H683 H684 H685 H689 H721 K0 L1 L130 L145 M210 M212 M213 M214 M215 M216 M231 M263 M272 M280 M281 M311 M312 M313 M314 M315 M320 M321 M332 M334 M340 M342 M343 M344 M349 M362 M391 M416 M710 M904 M905 Q010 Q110 Q454 R038 R042 R043 R045
DCN: 0068-99101-N

L103 ANSWER 9 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-602617 [65] WPIX
DNN N2002-477779

TI Bellows type pumping unit for circulation of hydrogen in
fuel cell, includes bellows which is reciprocated
by rotation of swash plate through drive shaft.
DC Q56 Q65 X16
PA (NPDE) NIPPONDENSO CO LTD
CYC 1
PI JP 2002147363 A 20020522 (200265)* 10p F04B043-08
ADT JP 2002147363 A JP 2000-344250 20001110
PRAI JP 2000-344250 20001110
IC ICM F04B043-08
ICS F04B053-10; F16J003-04; H01M008-04
AB JP2002147363 A UPAB: 20021010
NOVELTY - Multiple bellows units (1) are arranged along the axial direction of the rotation shaft (13) to which a swash plate (14) is fitted. One end of each bellows unit is closed by a cap (3), and fluid suction and delivery paths (7,8) are provided at the other end. The bellows (2) is reciprocated by rotation of swash plate through a drive shaft (15).

USE - Bellows type pumping unit for circulation of hydrogen in **fuel cell** used in vehicles.

ADVANTAGE - Use of bellows enables circulation of large flow rate due to the increased elasticity compared to a **diaphragm pump** and attains size reduction of pump which is easily fittable to vehicle.

DESCRIPTION OF DRAWING(S) - The figure shows a sectional view of the bellows-type pumping plant.
Bellows unit 1
Bellows 2
Cap 3
Suction path 7
Delivery path 8
Rotation shaft 13
Swash plate 14
Drive shaft 15
Dwg.1/12
FS EPI GMPI
FA AB; GI
MC EPI: X16-C09

L103 ANSWER 10 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-402586 [43] WPIX
DNN N2002-315721
TI Combustible fuel supply system for gas turbine, rocket or jet
engine, includes fuel metering pump which provides constant pressure
fuel to fuel consumption device without using accumulator metering
valve.
DC Q56 W06
IN JANSEN, H B

PA (JANS-N) JANSEN'S AIRCRAFT SYSTEMS CONTROLS INC
CYC 1
PI US 6371740 B1 20020416 (200243)* 8p F04B017-00
ADT US 6371740 B1 Provisional US 1999-133594P 19990511, US 2000-568370 20000510
PRAI US 1999-133594P 19990511; US 2000-568370 20000510
IC ICM F04B017-00
AB US 6371740 B UPAB: 20020709

NOVELTY - A fuel metering pump (12) connected between a fuel source and a fuel consumption device, includes pump chambers (66,67) sealed by diaphragms (76,77). The chambers include the pumping units (54,55) abutted to a motor driven face cam (44) that alternately reciprocates the pumping units through the pump and suction strokes. The pump provides constant pressure fuel to the consumption device without using an accumulator metering valve.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for fuel metering pump.

USE - For supplying combustion fuel to gas turbine engine used for land-based, air or space vehicle, e.g. rocket or jet engine. Also for **fuel cell**, etc.

ADVANTAGE - The cam operated metering **pump** with rolling **diaphragm** prevents the degradation of the pump from fuel and contaminants. Since the pump is mounted to the fuel tank, no fuel lines are needed by which a compact package is achieved and vapor-to-liquid ratio of the pump is increased.

DESCRIPTION OF DRAWING(S) - The figure shows a cross-sectional view of the fuel supply system.

Fuel metering pump 12
Motor driven face cam 44
Pumping units 54,55
Pump chambers 66,67
Diaphragms 76,77
Dwg.3/6

FS EPI GMPI
FA AB; GI
MC EPI: W06-B01C

L103 ANSWER 11 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-388109 [42] WPIX
DNN N2002-304147 DNC C2002-109719
TI Hydrogen rich heating gas formation apparatus for **fuel cells**, has pressure control mechanism in raw material supply mechanism, transport gas supply structure or heating gas supply structure to control total pressure of gas.
DC E36 H06 L03 T06 X16
PA (TOYT) TOYOTA JIDOSHA KK
CYC 1
PI JP 2002068703 A 20020308 (200242)* 12p C01B003-32

ADT JP 2002068703 A JP 2000-252230 20000823
PRAI JP 2000-252230 20000823
IC ICM C01B003-32
ICS C01B003-38; C01B003-56; H01M008-04; H01M008-06
AB JP2002068703 A UPAB: 20020711
NOVELTY - A pressure control mechanism is provided in raw material supply mechanism, transport gas supply structure or in heating gas supply structure to control total pressure of gas supplied, depending on load of **fuel cell.**

DETAILED DESCRIPTION - A raw material supply mechanism feeds raw material to a chemical reaction portion that forms a vapor containing hydrogen gas. A separation layer permeates only hydrogen from the mixed gas to be extracted using a transport gas supplied by a transport gas supply structure. The transport gas supply structure circulates the gas through the **fuel cell.** A heating gas supply structure feeds extracted hydrogen to a **fuel cell.** A pressure control mechanism such as a **pump** or a **diaphragm** is arranged in the heating gas supply structure to increase the pressure of hot gas, during high load running. Alternately, the pressure control mechanism is arranged in either raw material supply mechanism or transport gas supply structure, so as to control the total pressure of raw material or transport gas for enlarging partial pressure of hydrogen in chemical reaction portion during high load. Alternately the raw material supply mechanism and the transport gas supply structure are individually provided with pressure control mechanisms for increasing total pressures of raw material gas and transport gas during highload maintaining the total pressure difference raw material of transport gas as a fixed value, and to control pressure in extraction portion to be greater than pressure in chemical reaction portion. A leakage detector such as a carbon monoxide sensor checks the leakage of gases other than hydrogen such as carbon monoxide in the downstream side of filter based on a parameter valve and provides a warning accordingly. An INDEPENDENT CLAIM is included for a method of forming hydrogen rich heating gas that involves controlling pressure of raw material and transport gas based on input load. The pressure in extraction portion is reduced below pressure in reaction portion, when a leakage is detected.

USE - For forming hydrogen rich heating gas for feeding to **fuel cells.**

ADVANTAGE - Increases reliability and efficiency. Alarms on leakage of dangerous gases, and promotes preventing leakages.

DESCRIPTION OF DRAWING(S) - The figure is a flowchart explaining pressure control process.
Dwg.2/7
KW [1] 97153-0-0-0 CL PRD; 783-0-0-0 CL DET
FS CPI EPI
FA AB; GI; DCN

MC CPI: E11-Q01; E11-Q03J; E11-S; E31-A02; E31-N05B; H06-A03; L03-E04
EPI: T06-B11; X16-C09; X16-C16
DRN 1423-U; 1532-P; 1532-U
CMC UPB 20020711
M3 *01* C106 C108 C550 C730 C800 C801 C802 C803 C805 C807 M411 M424
M740 M750 M904 M905 M910 N102 N120 Q413 Q431 Q454
DCN: R01423-K; R01423-A
M3 *02* C101 C550 C810 M411 M424 M720 M740 M904 M905 N164 N209 N224
N262 N513 N514 N520 N521 N522 N523 N524 N525 Q413 Q431 Q454
DCN: R01532-K; R01532-P

L103 ANSWER 12 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-195599 [25] WPIX
DNC C2002-060394
TI New bromofluorinated monomers, their copolymers and bromosulfonated fluorinated elastomers with very low glass transition for use in fabrication of e.g. hydrogen **fuel cell** membranes
produced by crosslinking them .
DC A14 A88 E16
IN AMEDURI, B M; ARMAND, M; BOUCHER, M; MANSERI, A
PA (HYDR-N) HYDRO-QUEBEC; (AMED-I) AMEDURI B M; (ARMA-I) ARMAND M;
(BOUC-I) BOUCHER M; (MANS-I) MANSERI A
CYC 97
PI WO 2001096268 A2 20011220 (200225)* FR 72p C07C021-02
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP
KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ
NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US
UZ VN YU ZA ZW
CA 2312194 A1 20011213 (200225) FR C07C021-18
AU 2001068869 A 20011224 (200227) C07C021-02
EP 1289915 A2 20030312 (200320) FR C07C021-02
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
NL PT RO SE SI TR
US 2003181615 A1 20030925 (200364) C08F004-34
JP 2004502786 W 20040129 (200413) 108p C07C021-18
ADT WO 2001096268 A2 WO 2001-CA878 20010612; CA 2312194 A1 CA 2000-2312194 20000613; AU 2001068869 A AU 2001-68869 20010612; EP 1289915 A2 EP 2001-947073 20010612, WO 2001-CA878 20010612; US 2003181615 A1 WO 2001-CA878 20010612, US 2003-296833 20030306; JP 2004502786 W WO 2001-CA878 20010612, JP 2002-510414 20010612
FDT AU 2001068869 A Based on WO 2001096268; EP 1289915 A2 Based on WO 2001096268; JP 2004502786 W Based on WO 2001096268
PRAI CA 2000-2312194 20000613
IC ICM C07C021-02; C07C021-18; C08F004-34
ICS C08F002-00; C08F004-04; C08F004-32; C08F014-18; C08F214-16;

C08F214-18; C08F214-22; C08F216-14; C08F220-28; C08F228-02; C08F230-02; C08J003-24; C08J005-22; C09K003-10

AB WO 200196268 A UPAB: 20020418

NOVELTY - New bromofluorinated monomers, methods of preparing copolymers of them with brominated trifluorovinylic monomers optionally containing a sulfonyl group, the copolymers produced and elastomers prepared by crosslinking them.

DETAILED DESCRIPTION - The new compounds are of Formula (I).

F2C=CFX(CY2)nBr (I)

X = H, null;

Y = H, F;

n = integer 0-10.

Preferred forms are of Formula (II), (II') and (II).

F2C=CF(CH2)nBr (II)

F2C=CFBr (II')

F2C-CF(CH2)2Br (II)

Other monomers used are of Formula (III1), (III2) and (VI).

F2C=CFORF1 (III1)

F2C=CFORF2-G (III2)

FCX=CYZ (VI)

RF1 = CnF2n+1;

RF2 = CnF2n;

G = SO2FCO2R, P(O)(OR');

R = CpH2p+1;

p = integer 0-5;

R' = H, 1-5C alkyl;

X, Y, Z = H, F, Cl, CnF2n=1;

X, Y, and Z are not simultaneously F.

Random copolymers produced are of Formula (IV), (V), (VII) and (VIII).

-(-(CF2-CFBr)n-(-CF2CF(ORF-G))m)p- (IV) -(-(CF2-CF(C2H4Br))q-(CF2CF(ORF-G))r-)s- (V) -(-(CF2(CFBr)a-(CH2CF2)b-(CF2CF(ORF-G))c-)d- (VII) -(-(CF2CF(C2H4Br))e-(CH2CF2)f-CF2CF(ORF-G))g-)h- (VIII)

RF = RF1, RF2;

m, n, q, r = integer;

n/m, q/r = 2-23;

p, s = 10-300;

a, b, c = integer;

b/a = 0.1-15;

b/c = 1-20;

d = 15-150.

When RF is RF1, G is not present.

a fluorinated copolymer is prepared by radical copolymerization (I) with (III1) or (III2), (II') with (III1) or (III2) to give (IV), (II) with (III1) or (III2) to give (V) and a method of copolymerization comprising the reaction of (II') with (III1) and (III2) (VI) to give (VII) and (II) with (III1) or (III2) and (VI) to give (VIII). The copolymers are crosslinked to yield a

bromosulfonated fluorinated elastomer. An INDEPENDENT CLAIM is included for a method of crosslinking the sulfonyl groups of the claimed elastomers in the course of which at least some of the crosslinking bonds carry an ionic charge and which comprises contacting the polymer with a crosslinking agent to permit the reaction of two sulfonyl groups on adjacent polymer chains.

USE - The elastomers are used for the fabrication of membranes, polymer electrolytes, ionomers, parts of hydrogen or methanol fuel cells, to obtain sealing joints, torus joints, flexible hoses, pipes, pump bodies, diaphragms, piston heads for use in the aeronautical, petroleum, motor, mining and nuclear industries and for plasturgy.

ADVANTAGE - The copolymers have a very low glass transition temperature and produce elastomers having good resistance to acids, petroleum, and fuels and good handling properties. Tetrafluoroethylene is not used in their preparation.
Dwg.0/0

TECH WO 200196268 A2UPTX: 20020418
TECHNOLOGY FOCUS - POLYMERS - Preferred Method: The copolymerization method is conducted as a batch process, preferably in emulsion, micro-emulsion, suspension or solution. The reaction is initiated by an organic radical initiator, preferably a peroxide, perester, percarbonate, alkyl peroxypivalate or a diazoic compound. More preferably the reaction is conducted in the presence of t-butyl peroxide, hydroperoxide or peroxypivalate or t-amyl peroxypivalate and benzoyl peroxide and t-butyl cyclohexyl peroxydicarbonate in such a concentration that the initiator/monomer molar ratio is 0.1-2 and more preferably 0.5-1. Where the reaction is conducted in the presence of t-butyl peroxypivalate the reaction temperature is 70-80 degreesC, preferably 75 degreesC and in the presence of t-butyl peroxyide it is 135- 145 degreesC, preferably 140 degreesC. At least one organic solvent is present, preferably perfluoro-n- hexane, acetonitrile or mixtures of them. It is present at 0.5-15 wt.% with respect to the monomers and more preferably at 0.6-1.2 wt.%.
Preferred Components: The preferred monomer (III2) is perfluoro(4-methyl-3,6-dioxaoct-7- ene) sulfonyl fluoride. The fluorinated bromofunctional copolymers contain 7-24% bromotrifluoroethylene; 20-30% perfluoro(4-methyl-3,6-dioxaoct-7-ene) sulfonyl fluoride and 56-73% vinylidene fluoride or 7-24% 1,1,2-trifluoro-4-bromobutene; 20-30% perfluoro(4-methyl-3,6-dioxaoct-7-ene) sulfonyl fluoride and 65-78% vinylidene fluoride. Other fluorinated bromofunctional copolymers possessing specified chemical functions or fluorinated groups associated with specified chemical displacements in RMN 19F are claimed.
Preferred Elastomer: The elastomer is prepared by crosslinking the presence of 1-5% of a peroxide and 5-20% of triallyl isocyanurate and then heat treated at 200-220 degreesC. The Tg of the elastomers measured in accordance with ASTM E-1356-98 are between -45 and -18

degreesC and preferably between -35 and -21 degreesC. The inherent viscosity measured in accordance with ASTM D-2857-95 is 0.8-1.8 ml/g. It has ATG thermostability up to 325 degreesC under air at 10 degreesC/min at which a 5% loss of mass is observed

ABEX WO 200196268 A2UPTX: 20020418
EXAMPLE - A Carius tube was charged with 175 g (1.1 mol) bromine and 1.1g (0.006 mol) benzophenone and cooled to -80 degreesC in a mixture of liquid nitrogen and acetone. After 3 vacuum/nitrogen cycles 131 g (1.12 mol) of chlorotrifluoroethylene were introduced. The tube was sealed and progressively reheated to -40 degreesC, controlling the exothermicity by immersion in a bath at -80 degreesC. After the reaction mass had lost color, the solution was stirred at ambient temperature under UV for 1 hour. Distillation gave 175 g of a colorless liquid, b.pt 90-92 degreesC at a yield of 91%. Measurements were 19F RMN (CDCl2) delta: -60.1 (system AB, 2JFF = 166.8 Hz, 3JfF = 13.5 Hz, 3JFF = 15.0 Hz, BrCF2, F); -69.4 (part X of a system ABX, 3JFF = 13.1 Hz, 3JFF = 14.7 Hz, CFCl, 1F).

KW [1] 500356-0-0-0 CL NEW; 500357-0-0-0 CL NEW; 0056-00901 CL NEW; 397-0-0-0 CL USE; 326-0-0-0 CL USE; 2366-0-0-0 CL USE; 231395-0-0-0 CL USE; 79-0-0-0 CL USE; 0056-00902 CL USE; 0056-00903 CL USE

FS CPI

FA AB; DCN

MC CPI: A04-E10C; A04-E10D; E10-A04B; E10-A16B; E10-H01C; E10-H03D2

DRN 0389-U; 0610-U; 0899-U

PLE UPA 20020418

[1.1] 018; H0022 H0011; G0806 G0022 D01 D51 D53 D11 D10 D12 D59 D82 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 F34 F- 7A Br D69; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F- 7A D83 D84 D85 D86 D87 D88 D89 D90 D91 D92; H0113 H0011; H0124-R; M9999 M2073; L9999 L2391; L9999 L2073; L9999 L2528 L2506; L9999 L2551 L2506; L9999 L2664 L2506; L9999 L2675 L2506; P0588

[1.2] 018; H0022 H0011; G0806 G0022 D01 D51 D53 D11 D10 D12 D59 D82 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 F34 F- 7A Br D69; G0806 G0022 D01 D51 D53 D11 D10 D12 D59 D60 D63 D64 D69 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93 D94 F34 F36 F35 F89 F41 F54 F61 F- 7A; H0113 H0011; H0124-R; M9999 M2073; L9999 L2391; L9999 L2073; L9999 L2528 L2506; L9999 L2551 L2506; L9999 L2664 L2506; L9999 L2675 L2506; P0588

[1.3] 018; G0806 G0022 D01 D51 D53 D11 D10 D12 D59 D82 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 F34 F- 7A Br D69; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F- 7A D83 D84 D85 D86 D87 D88 D89 D90 D91 D92; G0806 G0022 D01 D51 D53 D11 D10 D12 D59 D60 D63 D64 D69 D83 D84 D85 D86 D87 D88 D89 D90 D91 D92 D93 D94 F34 F36 F35 F89 F41 F54 F61 F- 7A; G0022-R D01 D51 D53 D12 D10 D58 D59 D69 D82 D83 D84 D85 D86 D87 D88 D89 D90 D91 F- 7A Cl; R00363 G0555 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F- 7A; H0113 H0011; H0124-R;

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                M9999 M2073; L9999 L2391; L9999 L2073; L9999 L2528 L2506;
                L9999 L2551 L2506; L9999 L2664 L2506; L9999 L2675 L2506;
                P0588; H0033 H0011
       [1.4]    018; ND04; B9999 B5618 B5572; Q9999 Q7410 Q7330; Q9999
                Q8060; B9999 B5094 B4977 B4740; B9999 B5209 B5185 B4740;
                B9999 B4682 B4568; B9999 B3678 B3554; Q9999 Q7330-R; Q9999
                Q9018; Q9999 Q8731 Q8719; B9999 B4035 B3930 B3838 B3747;
                Q9999 Q7976 Q7885; Q9999 Q9223 Q9212; Q9999 Q9289 Q9212;
                Q9999 Q9234 Q9212; Q9999 Q7910 Q7885; Q9999 Q8139 Q8093;
                Q9999 Q8162; B9999 B4580 B4568; B9999 B4671 B4568
       [1.5]    018; D01 F13; R00389 D01 D11 D10 D50 D84 F48; R00899 D01
                D11 D10 D50 D88 F48; R05079 D01 D11 D10 D50 D63 D89 F42;
                R00610 D01 D19 D18 D32 D50 D63 D76 D93 F42; D01 D11 D10
                D50 D63 D90 F42; D01 D11 D10 D14 D13 D31 D76 D50 D63 D92
                F45; C999 C088-R C000; C999 C293
       [1.6]    018; D01 D11 D10 D50 D69 D86 F- 7A; R00342 D01 D11 D10 D50
                D82 F12; A999 A475; A999 A771
       [1.7]    018; F48; R00733 G0975 D01 D12 D10 D23 D22 D27 D31 D45 D51
                D55 D57 D58 D76 D92 F19 O- 6A; A999 A157-R; A999 A771
CMC   UPB   20020418
      M3   *01* H6   H601 H603 H607 H609 H684 H689 H7   H721 M280 M312 M321
                M332 M344 M363 M391 M416 M710 M904 M905 Q110
                DCN: RA67RC-N
      M3   *02* H6   H601 H603 H609 H681 H683 H684 H7   H721 M280 M314 M321
                M332 M344 M363 M391 M416 M710 M904 M905 Q110
                DCN: RA67RD-N
      M3   *03* C035 C100 H581 H6   H601 H603 H607 H608 H609 H681 H682 H683
                H684 H685 H686 H689 H7   H721 K140 M280 M311 M312 M313 M314
                M315 M316 M321 M322 M331 M332 M334 M340 M342 M343 M344 M362
                M363 M391 M392 M416 M710 M904 M905 Q110
                DCN: 0056-00901-N
      M3   *04* K0   K9   K930 M210 M214 M233 M272 M282 M320 M416 M620 M781
                M904 M905 M910 Q132 R043
                DCN: R00899-K; R00899-U
      M3   *05* K0   K9   K920 M210 M214 M233 M272 M281 M320 M416 M620 M781
                M904 M905 M910 Q132 R043
                DCN: R00389-K; R00389-U
      M3   *06* J0   J011 J2   J271 K0   K9   K910 M210 M214 M233 M262 M272
                M281 M320 M416 M620 M781 M904 M905 Q132 R043
                DCN: R05079-K; R05079-U
      M3   *07* J0   J011 J2   J271 K0   K9   K910 M210 M214 M215 M233 M262
                M272 M281 M320 M416 M620 M781 M904 M905 Q132 R043
                DCN: RA0NJ0-K; RA0NJ0-U
      M3   *08* G010 G019 G100 K0   K9   K910 K999 L5   L543 M280 M320 M414
                M510 M520 M532 M540 M781 M904 M905 M910 Q132 R043
                DCN: R00610-K; R00610-U
      M3   *09* G010 G019 G020 G021 G029 G030 G039 G040 G050 G100 G111 G221
                G299 G553 G563 J011 J131 J151 J171 J231 J241 J251 J261 J271
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               K0   K9   K910 K920 K930 K999 L410 L472 L499 L541 L543 M121
               M122 M123 M124 M125 M126 M146 M210 M211 M212 M213 M214 M215
               M216 M220 M221 M222 M223 M224 M225 M226 M231 M232 M233 M262
               M272 M280 M281 M282 M320 M414 M415 M416 M510 M520 M530 M531
               M532 M540 M541 M542 M620 M781 M904 M905 Q132 R043
               DCN: 0056-00902-K; 0056-00902-U
      M3  *10* G001 G002 G003 G010 G011 G012 G013 G019 G020 G021 G022 G029
               G030 G039 G040 G050 G100 G111 G221 G299 G553 G563 K0   K5
               K534 M121 M122 M123 M124 M125 M126 M145 M210 M211 M212 M213
               M214 M215 M216 M220 M221 M222 M223 M224 M225 M226 M231 M232
               M233 M273 M280 M281 M282 M320 M414 M415 M416 M510 M520 M530
               M531 M532 M540 M541 M542 M620 M781 M904 M905 Q132 R043
               DCN: 0056-00903-K; 0056-00903-U

L103 ANSWER 13 OF 25  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   2001-657266 [75]   WPIX
DNN  N2001-489926       DNC C2001-193410
TI   Electrolyzer for depositing metals e.g., zinc on conducting
     particles e.g., zinc has a cathode support including a particle
     contact surface on which a bed of electrically conductive particles
     constituting the cathode flows.
DC   M28 X25
IN   COLBORN, J A; EVANS, J W; PINTO, M; SMEDLEY, S
PA   (META-N) METALLIC POWER INC; (COLB-I) COLBORN J A; (EVAN-I) EVANS J
     W; (PINT-I) PINTO M; (SMED-I) SMEDLEY S
CYC  95
PI   WO 2001088225 A1 20011122 (200175)* EN   43p    C25C007-00
        RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
            MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
         W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
            DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE
            KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO
            NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG UZ VN
            YU ZA ZW
     AU 2001045928 A  20011126 (200222)              C25C007-00
     US 2002074232 A1 20020620 (200244)              C25D005-00
     US 6432292    B1 20020813 (200255)              C25D007-00
ADT  WO 2001088225 A1 WO 2001-US9132 20010323; AU 2001045928 A AU
     2001-45928 20010313; US 2002074232 A1 Cont of US 2000-573438
     20000516, US 2001-968931 20010924; US 6432292 B1 US 2000-573438
     20000516
FDT  AU 2001045928 A Based on WO 2001088225
PRAI US 2000-573438   20000516; US 2001-968931   20010924
IC   ICM  C25C007-00; C25D005-00; C25D007-00
     ICS  C25D017-00
AB   WO 200188225 A UPAB: 20011220
     NOVELTY - Electrolyzer has a cathode support including a particle
     contact surface configured to allow a force to cause a bed of
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electrically conductive particles constituting the cathode to flow across it. The cathode support has first and second portions at which the particles contact and leave the particle contact surface respectively.

DETAILED DESCRIPTION - Electrolyzer (100) for electrodeposition onto a cathode composed of electrically conductive particles comprises:

(a) a cathode support (102) including a particle contact surface configured to allow a force to cause a bed of electrically conductive particles to flow across it. The cathode support has a first portion at which the particles contact the particle contact surface and a second portion at which the particles leave this surface;

(b) an **anode** (104) spaced from the cathode; and

(c) a **recirculation** line (110) connecting the second and first portions of the cathode support.

INDEPENDENT CLAIMS are also included for the following:

(i) a device for performing an electrochemical process on electrically conductive particles; and

(ii) a method of electrodepositing metal on electrically conductive particles comprising: allowing a force to cause a bed of electrically conductive particles to flow across a particle contacting surface of a cathode support spaced from an **anode** ; avoiding sustained contact between the particles and the **anode;** and providing an electrical current between the bed of particles and the **anode,** so that metal is electrodeposited on the electrically conductive particles as they flow across the particle contacting surface.

USE - The electrolyzer is used for the electrodeposition of metals e.g., zinc on conducting particles e.g., zinc. The electrolyzer can be used for recovering zinc from zinc oxide in zinc/air **fuel cells.** The invention can be applied to any process for electrodeposition on electrically conducting particles or for any electrochemical process performed on conducting particles, such as electrowinning of copper, zinc, gold, silver, platinum or electrophoretic painting of particles, anodizing of aluminum particles or performing electro-oxidation or reduction on a high surface area electrode where some form of self cleaning is beneficial to long term performance.

ADVANTAGE - The electrolyzer maintains good electrical contact between the power supply and the conducting particles, does not require unacceptably high **pumping** power and eliminates the need for a separator. Separator erosion problems and short circuit problems caused by dendritic particle growth are eliminated. The electrolyzer has a high yield of electrodeposited material per unit volume.

DESCRIPTION OF DRAWING(S) - The drawing shows a schematic illustration of an electrolyzer for electrodeposition on

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     electrically conductive particles.
     Electrolyzer 100
          Cathode support 102
       Anode 104
          Feed reservoir 106
          Receiving reservoir 108
            Recirculation line 110
          Electrolyte fluid tank 112
     Bleed line 114
          Fluid supply line 116
       Pump 118
     Dwg.1/8
TECH WO 200188225 A1UPTX: 20011220
     TECHNOLOGY FOCUS - METALLURGY - Preferred Apparatus: The particle
     contacting surface of the cathode support is an inclined surface and
     gravity causes the particles to flow down this inclined surface. The
     angle of the inclined surface is 5 - 75 degrees preferably 10 - 45
     degrees, more preferably 15 - 30 degrees from horizontal.
FS   CPI EPI
FA   AB; GI
MC   CPI: M28-C03
     EPI: X25-R02

L103 ANSWER 14 OF 25  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   2001-581352 [65]   WPIX
DNC  C2001-172271
TI   Fluorinated elastomers used as seals hoses and joints comprise a
     copolymer of e.g. vinylidene fluoride and perfluorosulfonyl
     ethoxypropyl vinyl ether fluoride.
DC   A14 A85 A88 A95
IN   AMERUDI, B M; ARMAND, M; BOUCHER, M; MANSERI, A; AMEDURI, B M
PA   (HYDR-N) HYDRO-QUEBEC; (AMED-I) AMEDURI B M; (ARMA-I) ARMAND M;
     (BOUC-I) BOUCHER M; (MANS-I) MANSERI A
CYC  95
PI   WO 2001049757 A1 20010712 (200165)* FR   29p    C08F214-22
        RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
            MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
         W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE
            DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG
            KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ
            PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN
            YU ZA ZW
     CA 2293846    A1 20010629 (200165)  FR          C08F228-02
     CA 2299622    A1 20010824 (200165)  FR          C08F228-02
     AU 2001024961 A  20010716 (200169)              C08F214-22
     EP 1252205    A1 20021030 (200279)  FR          C08F214-22
         R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
            NL PT RO SE SI TR
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     JP 2003519259 W  20030617 (200349)      24p    C08F214-22
     US 2003148158 A1 20030807 (200358)             H01M008-10
ADT  WO 2001049757 A1 WO 2000-CA1585 20001229; CA 2293846 A1 CA
     1999-2293846 19991229; CA 2299622 A1 CA 2000-2299622 20000224; AU
     2001024961 A AU 2001-24961 20001229; EP 1252205 A1 EP 2000-988537
     20001229, WO 2000-CA1585 20001229; JP 2003519259 W WO 2000-CA1585
     20001229, JP 2001-550297 20001229; US 2003148158 A1 WO 2000-CA1585
     20001229, US 2002-168524 20021120
FDT  AU 2001024961 A Based on WO 2001049757; EP 1252205 A1 Based on WO
     2001049757; JP 2003519259 W Based on WO 2001049757
PRAI CA 2000-2299622  20000224; CA 1999-2293846  19991229
IC   ICM  C08F214-22; C08F228-02; H01M008-10
     ICS  H01M010-40
ICI  C08F214-22; C08F216:14
AB   WO 200149757 A UPAB: 20011108
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NOVELTY - Fluorinated elastomers (E), comprises a copolymer of e.g. vinylidene fluoride (VDF) and perfluorosulfonyl ethoxypropyl vinyl ether fluoride have a low glass transition temperature (Tg) and do not contain tetrafluoroethylene, hexafluoropropene or siloxane groups.

DETAILED DESCRIPTION - Fluorinated elastomers, comprises a copolymer of vinylidene fluoride (VDF) and of perfluorosulfonyl ethoxypropyl vinyl ether fluoride (PSEPVE) or of perfluoro(4-methyl-3,6-dioxaoct-7-ene) sulfonyl fluoride (PFSO2F), have a glass transition temperature (Tg) of -32 to -36 deg. C, and do not contain tetrafluoroethylene, hexafluoropropene or siloxane groups.

INDEPENDENT claims are included for:

(i) the following components where they contain the elastomer (E): polymeric electrolytes, ionomers, components of **fuel cells** (such as the membrane and the joints), joints, hose connections, pipes, O-rings, **pump** housing and **pump diaphragms**, and piston heads used in the aircraft, oil, automobile, mining, and nuclear industries; and

(ii) a process for the preparation of elastomers (E), comprises radical polymerization of the monomers in the presence of organic initiators for 2-6 hours at 20-200 deg. C and a pressure of 2-100 bars, while measuring the consumption of monomers.

USE - The elastomers are used e.g. as polymeric electrolytes, ionomers, components of **fuel cells** (such as the membrane and the joints), joints, hose connections, pipes, O-rings, **pump** housing and **pump diaphragms**, and piston heads used in the aircraft, oil, automobile, mining, and nuclear industries (claimed).

ADVANTAGE - The process for manufacture of suitable fluorinated elastomers is relatively simple and does not involve the use of dangerous materials such as tetrafluoroethylene.

Dwg.0/0

TECH WO 200149757 A1UPTX: 20011108
TECHNOLOGY FOCUS - POLYMERS - Preferred Elastomer: (E) preferably contains 20-40 mol.% of PSEPVE or PFSO2F and 80-60 mol.% of VDF, and includes at least one fluorinated olefinic hydrocarbon (O), preferably selected from vinyl fluoride, trifluoroethylene, chlorotrifluoroethylene, bromotrifluoroethylene, hydropentafluoropropylene, hexafluoroisobutylene, trifluoropropene, 1,2-dichlorodifluoroethylene and 2-chloro-1,1- difluoroethylene, and/or a perfluoro vinyl ether 3-50 mol.%, selected from a perfluoroalkyl (especially perfluoromethyl or perfluoropropyl) vinyl ether, a perfluoroalkoxyalkyl vinyl ether selected from perfluoro(2-n-propoxy)propyl vinyl ether, perfluoro(2-methoxy)propyl vinyl ether, perfluoro(3-methoxy)propyl vinyl ether, perfluoro(2-methoxy)ethyl vinyl ether, perfluoro(3,6,9-trioxa-5,8-dimethyl)-dodeca-1-ene, and/or perfluoro(5-methyl-3,6-dioxo)-1-nonene.
Preferred Solvent: The polymerisation is preferably carried out in the presence of a solvent selected from either esters of formula (I), fluorinated solvents such as perfluorohexane (preferably ClCF2CFCl2, n-C6F14, n-C4F10 and perfluoro-2-butyl-tetrahydro-furan), and solvents selected from methyl acetate, 1,2-dichloroethane, isopropanol, tert-butanol, acetonitrile and butyronitrile (preferably methyl acetate or acetonitrile).
R-COOR' (I)
R = H, 1-5C alkyl or OR'' (preferably H or CH3);
R' = 1-5C alkyl or OR'' (preferably methyl, ethyl, iso-propyl or tert.-butyl); and
R'' = 1-5 C alkyl.
Preferred Conditions: The temperature of copolymerization is preferably 40-80 degrees C and the pressure is 20-40 bar. The polymerisation preferably takes place in an emulsion, a microemulsion, undiluted, in suspension, in a microsuspension or in solution.
Preferred Olefin: Olefin (O) is preferably of formula (II).
R1R2C=CR3R4 (II)
R1-R4 = (per)fluoro alkyl.
Preferred Initiator: The initiator is preferably of the type e.g. acetyl cyclohexane sulfonyl peroxide, benzoyl peroxide, diethyl peroxy dicarbonate etc. The ratio of initiator/monomer is 0.1-2 %.
Preferred Composition: The copolymerization composition may also contain a surface active agent (1-3 wt.% of anionic, cationic or non ionic surfactant) and chain transfer agents.

ABEX WO 200149757 A1UPTX: 20011108
EXAMPLE - A vessel was charged with 75% t-butyl peroxypivalate (0.135 mmol), perfluoro(4-methyl-3,6-dioxaoct-7-ene) sulfonyl fluoride (PFSO2F) (2.66 mmol), and methyl acetate (26.4 mmol) and purged with He at 100 mm Hg for at least 5 cycles. Vinylidene fluoride (VDF) (0.007 mol +/- 8 mg) at a pressure of 0.28 bar, was

then added to the tube, which had been cooled in liquid nitrogen. The mixture was stirred at 75 degrees C for 6 hours to complete polymerization. The conversion of VDF was 82% and the copolymer had a composition of 72/28 VDF/PFSO2F. The Tg of the copolymer was -34.8 degrees C.

FS CPI

FA AB

MC CPI: A04-E07; A04-E10; A12-E06; A12-H00H; A12-T03; A12-T04

PLE UPA 20011121

[1.1] 018; R00363 G0555 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F-7A; G0022-R D01 D51 D53 D11 D10 D12 D58 D69 D85 F61 F34 F-7A; H0124-R; L9999 L2528 L2506; L9999 L2664 L2506; L9999 L2551 L2506; L9999 L2835; S9999 S1627 S1605; S9999 S1025 S1014; S9999 S1661; H0022 H0011

[1.2] 018; R00363 G0555 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F-7A; G0022-R D01 D51 D53 D11 D10 D12 D58 D69 D93 F20 F61 F-7A; H0124-R; L9999 L2528 L2506; L9999 L2664 L2506; L9999 L2551 L2506; L9999 L2835; S9999 S1627 S1605; S9999 S1025 S1014; S9999 S1661; H0022 H0011

[1.3] 018; ND01; ND07; Q9999 Q9018; Q9999 Q8731 Q8719; Q9999 Q7410 Q7330; Q9999 Q9223 Q9212; Q9999 Q9234 Q9212; Q9999 Q9289 Q9212; Q9999 Q8093-R; Q9999 Q6973 Q6939; N9999 N6439; N9999 N5890 N5889; N9999 N6177-R; N9999 N6644; N9999 N6633 N6611; N9999 N5812-R; N9999 N6655-R; B9999 B3372-R; B9999 B4535; B9999 B4466-R; K9905; K9416

[1.4] 018; B9999 B5618 B5572

[1.5] 018; R00610 D01 D19 D18 D32 D50 D63 D76 D93 F42; R08437 D01 D11 D10 D14 D13 D31 D50 D63 D76 D88 F42 F62; R24085 D01 D10 D11 D50 D93 F45; C999 C088-R C000; C999 C293; C999 C340

[1.6] 018; R00811 G1989 G1978 D01 D11 D10 D50 D69 D82 Cl 7A; R00271 D01 D11 D10 D50 D83 F27 F26; R00373 G3496 D01 D10 D11 D50 D84 F26 F27; R00342 D01 D11 D10 D50 D82 F12; A999 A475; A999 A771

[1.7] 018; A999 A635 A624 A566; K9643 K9621; K9632 K9621; K9325

[2.1] 018; R00363 G0555 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F-7A; G0033-R G0022 D01 D02 D51 D53; R00339 G0544 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F- 7A; R06317 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; R00458 G0022 D01 D12 D10 D53 D51 D59 D69 D82 F- 7A Cl; G0022-R D01 D51 D53 D12 D10 D59 D69 D82 Br 7A; G0022-R D01 D51 D53 D12 D10 D59 D69 D83 F- 7A; G0022-R D01 D51 D53 D12 D10 D58 D69 D84 F- 7A; G0022-R D01 D51 D53 D12 D10 D58 D69 D83 F- 7A; G0022-R D01 D51 D53 D12 D10 D58 D69 D82 F- 7A Cl; G0022-R D01 D51 D53 D12 D10 D58 D69 D82 F- 7A Cl; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F- 7A; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F- 7A D83; G0759 G0022 D01 D11 D10 D12 D51 D53 D59 D69 F34 F- 7A D85; G0759 G0022 D01 D11 D10 D12 D51

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         D53 D59 D69 F34 F- 7A D88; G0759 G0022 D01 D11 D10 D12 D51
         D53 D59 D69 F34 F- 7A D86; G0022-R D01 D51 D53 D11 D10 D12
         D58 D69 D90 F34 F- 7A; H0124-R; L9999 L2528 L2506; L9999
         L2664 L2506; L9999 L2551 L2506; L9999 L2835; S9999 S1627
         S1605; S9999 S1025 S1014; S9999 S1661; M9999 M2255 M2222;
         H0022 H0011; H0033 H0011; P1150
 [2.2]   018; ND01; ND07; Q9999 Q9018; Q9999 Q8731 Q8719; Q9999
         Q7410 Q7330; Q9999 Q9223 Q9212; Q9999 Q9234 Q9212; Q9999
         Q9289 Q9212; Q9999 Q8093-R; Q9999 Q6973 Q6939; N9999
         N6439; N9999 N5890 N5889; N9999 N6177-R; N9999 N6644;
         N9999 N6633 N6611; N9999 N5812-R; N9999 N6655-R; B9999
         B3372-R; B9999 B4535; B9999 B4466-R; K9905; K9416
 [2.3]   018; F- 7A; H0157
 [2.4]   018; R00610 D01 D19 D18 D32 D50 D63 D76 D93 F42; R08437
         D01 D11 D10 D14 D13 D31 D50 D63 D76 D88 F42 F62; R24085
         D01 D10 D11 D50 D93 F45; C999 C088-R C000; C999 C293; C999
         C340
 [2.5]   018; R00811 G1989 G1978 D01 D11 D10 D50 D69 D82 Cl 7A;
         R00271 D01 D11 D10 D50 D83 F27 F26; R00373 G3496 D01 D10
         D11 D50 D84 F26 F27; R00342 D01 D11 D10 D50 D82 F12; A999
         A475; A999 A771
 [2.6]   018; A999 A635 A624 A566; K9643 K9621; K9632 K9621; K9325

L103 ANSWER 15 OF 25  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   2001-522089 [57]   WPIX
DNC  C2001-155798
TI   Fluorinated elastomers used as seal hoses and joints, comprise a
     copolymer of e.g. hexafluoropropene and perfluorosulphonyl ethoxy
     propyl vinyl ether fluoride.
DC   A14 A85 A88 A95
IN   AMERUDI, B M; ARMAND, M; BOUCHER, M; MANSERI, A; AMEDURI, B M
PA   (HYDR-N) HYDRO-QUEBEC; (AMED-I) AMEDURI B M; (ARMA-I) ARMAND M;
     (BOUC-I) BOUCHER M; (MANS-I) MANSERI A
CYC  95
PI   WO 2001049760 A1 20010712 (200157)* FR   31p    C08F214-28
        RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC
            MW MZ NL OA PT SD SE SL SZ TR TZ UG ZW
         W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CR CU CZ DE
            DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG
            KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ
            PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN
            YU ZA ZW
     CA 2293845     A1 20010629 (200157)  FR          C08F228-02
     CA 2299621     A1 20010824 (200162)  FR          C08F228-02
     AU 2001023383 A  20010716 (200169)               C08F214-28
     EP 1242486     A1 20020925 (200271)  FR          C08F214-28
         R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
            NL PT RO SE SI TR
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JP 2003519261 W 20030617 (200349) 27p C08F214-28
US 2003153699 A1 20030814 (200355) C08F214-18
ADT WO 2001049760 A1 WO 2000-CA1589 20001229; CA 2293845 A1 CA 1999-2293845 19991229; CA 2299621 A1 CA 2000-2299621 20000224; AU 2001023383 A AU 2001-23383 20001229; EP 1242486 A1 EP 2000-986958 20001229, WO 2000-CA1589 20001229; JP 2003519261 W WO 2000-CA1589 20001229, JP 2001-550300 20001229; US 2003153699 A1 WO 2000-CA1589 20001229, US 2002-168525 20021126
FDT AU 2001023383 A Based on WO 2001049760; EP 1242486 A1 Based on WO 2001049760; JP 2003519261 W Based on WO 2001049760
PRAI CA 2000-2299621 20000224; CA 1999-2293845 19991229
IC ICM C08F214-18; C08F214-28; C08F228-02
ICS C08F214-22; C08F216-14
AB WO 200149760 A UPAB: 20011005
NOVELTY - Fluorinated elastomers (E) comprising a copolymer of e.g. hexafluoropropene (HFP) and perfluorosulphonyl ethoxy propyl vinyl ether fluoride have a low glass transition temperature (Tg) and do not contain tetrafluoroethylene, or siloxane groups.

DETAILED DESCRIPTION - Fluorinated elastomers comprising a copolymer of hexafluoropropene (HFP) and of perfluorosulfonyl ethoxy propyl vinyl ether fluoride (PSEPVE) or of perfluoro(4-methyl-3,6-dioxaoct-7-ene) sulfonyl fluoride (PFSO2F), have a glass transition temperature (Tg) = -36 to -50 deg. C and do not contain tetrafluoroethylene, or siloxane groups.

INDEPENDENT CLAIMS are also included for:

(i) the following components where they contain elastomer (E): polymeric electrolytes, ionomers, components of **fuel cells** (such as the membrane and the joints), joints, hose connections, pipes, O-rings, **pump** housing and **pump diaphragms**, and piston heads used in the aircraft, oil, automobile, mining, and nuclear industries; and

(ii) a process for the preparation of elastomers (E) by radical polymerization for 3 to 6 hours in the presence of organic initiators at 20 to 200 deg. C and a pressure = 2-100 bars while measuring the consumption of monomers by pressure drop.

USE - The elastomers are used e.g. as polymeric electrolytes, ionomers, components of **fuel cells** (such as the membrane and the joints), joints, hose connections, pipes, O-rings, **pump** housing and **pump diaphragms**, and piston heads used in the aircraft, oil, automobile, mining, and nuclear industries.

ADVANTAGE - Very low Tg copolymers can be produced without the use of siloxanes and HFP is much lower cost than TFE.
Dwg.0/0
TECH WO 200149760 A1UPTX: 20011005
TECHNOLOGY FOCUS - POLYMERS - Preferred Elastomer: Elastomer (E) preferably contains 20-32 mole % (especially 10 to 32 mole %) of HFP and 80 to 68 mole % (especially 19 to 79 mole %) of PSEPVE or PFS02F

and optionally includes vinylidene fluoride (0 to 71 mole %) and at least one fluorinated olefinic hydrocarbon (O) preferably selected from vinyl fluoride, trifluoroethylene, chlorotrifluoroethylene, bromotrifluoroethylene, hydropentafluoropropylene, hexafluoroisobutylene, trifluoropropene, 3,3,3-trifluoropropene, 1,2-dichlorodifluoroethylene and 2-chloro-1, 1- difluoroethylene, 1,2-difluoroethylene and 1,1-difluorodichloroethylene; and/or a perfluoro vinyl ether selected from a perfluoroalkyl (especially perfluoromethyl or perfluoropropyl vinyl ether), a perfluoroalkoxyalkyl vinyl ether selected from perfluoro(2-n-propoxy)propyl vinyl ether, perfluoro(2-methoxy)propyl vinyl ether, perfluoro(3-methoxy)propyl vinyl ether, perfluoro(2-methoxy)ethyl vinyl ether, perfluoro(3,6,9-trioxa-5,8-dimethyl)-dodeca-1-ene, perfluoro(5-methyl-3,6-dioxo)-1-nonene and mixtures of these.
Preferred Method: The polymerization is preferably carried out in the presence of a solvent selected from (a) esters with formula R-COOR'.
R and R' = 1-5 C alkyl or OR'';
R'' = 1-5 C alkyl;
preferably R = H;
(b) fluorinated solvents such as perfluorohexane and (c) solvents selected from methyl acetate, 1,2-dichloroethane, isopropanol, tert-butanol, acetonitrile and butyronitrile. Especially preferred are (i) R-COOR';
R = CH3, C2H5, I-C3H7 or t-C4H9 and;
R = H or CH3;
(ii) ClCF2CFCl2, n-C614, n-C4F10 and perfluoro-2-butyl-tetrahydro-furan; (iii) methyl acetate or acetonitrile. The temperature of copolymerization is preferably 55 to 80 degrees C and the pressure = 20-40 bars. The polymerization preferably takes place in an emulsion, a microemulsion, undiluted, in suspension, in a microsuspension or in solution.
Preferred Olefin: olefin (O) is preferably R1R2C=CR3R4.
R1 to R4 = (per)fluoro.
Preferred Initiator: This is e.g. acetylcyclohexanesulfonyl peroxide, benzoyl peroxide, diethyl peroxydicarbonate, etc.. The ratio of initiator/monomer = 0.1 to 2 %.
Preferred Composition: the process of copolymerization may also contain a surface active agent e.g. perfluoro ammonium sulfate and chain transfer agents

ABEX WO 200149760 A1UPTX: 20011005
EXAMPLE - Copolymerization of HFP/PFSO2F (80.0/20.0 mole % initial charge). A Carius tube was charged with 0.5 mmol 75% t-butyl peroxypivalate, 4.96 mmol (PFS02F), and 0.030 mmol acetonitrile and purged with He at 100 mm Hg for at least 5 cycles to eliminate O2. HFP (0.02 moles) was then added to the tube, which had been cooled in liquid nitrogen. The tube was mixed at 75 degrees C for 6 hours to complete polymerization. The conversion of HFP was 40% and the

copolymer had a composition = 31.8/68.2 HFP/PFSO2F. The Tg of the copolymer was -48 degrees C.

FS CPI
FA AB
MC CPI: A04-E10; A12-H02; A12-H08
PLE UPA 20011005
[1.1] 018; R00976 G0022 D01 D12 D10 D51 D53 D59 D69 D83 F- 7A; D58 D64 D69 D87 D89 F61 F- 7A D11 D10 G0806 G0022 D01 D51 D53; H0022 H0011; H0124-R; P0588; M9999 M2391; M9999 M2073; L9999 L2528 L2506; L9999 L2517 L2506; L9999 L2664 L2506; L9999 L2551 L2506; L9999 L2675 L2506
[1.2] 018; R00976 G0022 D01 D12 D10 D51 D53 D59 D69 D83 F- 7A; D58 D64 D69 D87 D89 F61 F- 7A D11 D10 G0806 G0022 D01 D51 D53; D58 D83 D84 D85 D88 D86 D92 D90 D11 D10 G0759 G0022 D01 D12 D51 D53 D59 D69 F34 F- 7A; R06317 G0022 D01 D12 D10 D51 D53 D59 D69 D82 F- 7A; R00458 G0022 D01 D12 D10 D53 D51 D59 D69 D82 F- 7A Cl; R00339 G0544 G0022 D01 D12 D10 D51 D53 D58 D69 D82 F- 7A; D58 D69 D82 F- 7A Br G0806 G0022 D01 D51 D53; D58 D69 D83 D84 D82 F- 7A Cl G0806 G0022 D01 D51 D53; H0033 H0011; H0124-R; P0588; M9999 M2391; M9999 M2073; L9999 L2528 L2506; L9999 L2517 L2506; L9999 L2664 L2506; L9999 L2551 L2506; L9999 L2675 L2506
[1.3] 018; ND01; Q9999 Q9018; Q9999 Q8764; Q9999 Q8060; Q9999 Q8162; Q9999 Q8720 Q8719; Q9999 Q8731 Q8719; Q9999 Q7410 Q7330; B9999 B5618 B5572; B9999 B4580 B4568; B9999 B4626 B4568; Q9999 Q9245 Q9212; Q9999 Q9234 Q9212; Q9999 Q8139 Q8093; K9665
[1.4] 018; C999 C215; C999 C293
[1.5] 018; R08437 D01 D11 D10 D14 D13 D31 D50 D63 D76 D88 F42 F62; R00610 D01 D19 D18 D32 D50 D63 D76 D93 F42; R00476 D01 D11 D10 D19 D18 D32 D50 D76 D93 F48; R24085 D01 D10 D11 D50 D93 F45; R05153 D01 D11 D10 D50 D63 D88 F45; R05079 D01 D11 D10 D50 D63 D89 F42; C999 C293; C999 C088-R C000
[1.6] 018; D01 D50 D63 D90 F42 D11 D10; C999 C293; C999 C088-R C000
[1.7] 018; D01 D31 D76 D50 D63 D92 F45 D11 D10 D14 D13; C999 C293; C999 C088-R C000
[1.8] 018; F13; C999 C293; C999 C088-R C000
[1.9] 018; D01 D50 D60 D63 D82 D83 D84 D85 D86 D87 D88 D89 D90 D91 D11 D10; A999 A475
[1.10] 018; D01 D50 D69 D84 D86 F- 7A D11 D10; A999 A475
[1.11] 018; D31 D75 D42 D50 D69 D88 F34 F- 7A D11 D10 D23 D22; R00398 D01 D11 D10 D50 D69 D82 F- 7A Cl; R00342 D01 D11 D10 D50 D82 F12; A999 A475
[1.12] 018; D01 D50 D63 D83 D11 D10 F89 F41; A999 A475
[1.13] 018; D01 D61-R F16 F62 D69 F- 7A; K9325; K9632 K9621; K9643 K9621; A999 A635 A624 A566

L103 ANSWER 16 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2001-388936 [41] WPIX
CR 2001-513228 [52]
DNN N2001-285979 DNC C2001-118597
TI Wear resistant or biocompatible ceramic coating with wide range of uses is of amorphous, conductive transition metal nitride(s) and applied at room temperature to substrate.
DC A32 A88 B07 D22 F02 G02 G03 J01 L03 M13 P42 T03 U11 V02 V04 X16
IN KHANWILKAR, P; KUMAR, B A; OLSEN, D B
PA (KHAN-I) KHANWILKAR P; (KUMA-I) KUMAR B A; (OLSE-I) OLSEN D B
CYC 1
PI US 2001002000 A1 20010531 (200141)* 15p C23C014-00
ADT US 2001002000 A1 US 1998-71371 19980430
PRAI US 1998-71371 19980430
IC ICM C23C014-00
ICS B05D005-06; B05D005-08; B05D005-12
AB US2001002000 A UPAB: 20011005
NOVELTY - A wear resistant ceramic coating (I) of amorphous, conductive transition metal nitride(s) is applied at room temperature to a substrate.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:

(a) as above where the substrate is not deforming during coating and is for use in an abrasive environment;

(b) as above where the substrate is a semiconductor material of an integrated circuit and the coating increases the conductivity and reduces diffusion of the material;

(c) as above, (a) or (b) where the substrate is a thermally sensitive magnetic material or has other properties that are not damaged by applying the coating;

(d) an analog audio playback head, a cooking container, a plastic gear, a razor blade or a spark plug coated as above;

(e) modification of above method or (c) where the coating is biocompatible rather than wear resistant;

(f) as (e) and the coating is applied to non-biomaterials of an implantable device;

(g) applying a biocompatible coating to a diffusion barrier for a medical device at room temperature;

(h) a diffusion barrier for an implantable device has an amorphous biocompatible coating applied at room temperature applied to one side of a membrane; and

(i) use of (h) to prevent fluid exchange between implanted device and surrounding tissue;

USE - (I) is useful for use in gears, spark plugs, molds, plumbing fixtures, eyeglass frames, cutting drilling or writing instruments, kitchen utensils, jewelry, bearings, bushings, electrical devices, semiconductors, engine components, toys,

packaging, optical instruments, **fuel cells**,
recording media, implantable medical devices such as stents,
ventricular assist devices, **pumps**, impellers, balloons,
diaphragms, volume displacement chambers, plastic tubes,
catheters, occluders, bearing components, soft tissue implants,
valves, shunts, pacemakers, defibrillators, cardioverters,
electrodes, neural stimulators, filters, grafts, contraceptives,
sensors, transducers, needles, tubes, clips, surgical staples,
prostheses and electro-surgical blades.

ADVANTAGE - The coating can be biocompatible, flexible,
radio-opaque, resist diffusion wear and corrosion, hydrophobic,
hydrophilic, adhere to many types of materials, sterilized,
chemically inert and stable.

DESCRIPTION OF DRAWING(S) - The drawing shows a coating
apparatus

stainless steel chamber 10
evacuation port 14
gas port 16
cathode 18
anode 20
ion flux 22
titanium nitride 24
titanium nitride sputtered flux 26
base substrate 30

Dwg.1/3

TECH US 2001002000 A1UPTX: 20010724
TECHNOLOGY FOCUS - POLYMERS - Preferred Polymer: The membrane is
made of polyurethane.

KW [1] 104486-0-0-0 CL NEW

FS CPI EPI GMPI

FA AB; GI; DCN

MC CPI: A11-C04B2; B04-C03; B11-C04; D09-C; F01-E; F01-H06; F03-E01;
F04-E04; F04-E05; G02-A05; J01-H; L03-H; M13-H
EPI: T03-A03J3; U11-A09; U11-C05B; V02-E01; V02-H02; V02-H04; V04-U;
X16-C

PLE UPA 20011005
[1.1] 018; P0000; S9999 S1661
[1.2] 018; ND01; K9676-R; K9494 K9483; B9999 B3407 B3383 B3372;
B9999 B3509 B3485 B3372; B9999 B4488 B4466; B9999 B4477
B4466; B9999 B5436 B5414 B5403 B5276; N9999 N7136 N7034
N7023; N9999 N7090 N7034 N7023; B9999 B4035 B3930 B3838
B3747; B9999 B4375 B4240; K9347-R K9790; B9999 B5287
B5276; B9999 B4591 B4568; Q9999 Q7976 Q7885; Q9999 Q7932
Q7885; Q9999 Q7896 Q7885; Q9999 Q8059 Q7987; Q9999 Q8048
Q7987; Q9999 Q8355 Q8264; Q9999 Q8231 Q8173; Q9999 Q7705
Q7681; Q9999 Q7545; Q9999 Q7330-R; Q9999 Q7476 Q7330;
Q9999 Q7987-R; Q9999 Q7965 Q7885; Q9999 Q8855-R; Q9999
Q8902 Q8899 Q8877 Q8855; Q9999 Q9201; Q9999 Q7874; Q9999

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              Q9427 Q7987; Q9999 Q8366-R; K9370; N9999 N6871 N6655;
              N9999 N7089 N7034 N7023; Q9999 Q7410 Q7330; Q9999 Q8026
              Q7987; Q9999 Q7761; Q9999 Q9165-R; Q9999 Q7409 Q7330;
              Q9999 Q7567; Q9999 Q7910 Q7885; Q9999 Q7921 Q7885
     [2.1]    018; P1592-R F77 D01
     [2.2]    018; ND01; K9676-R; K9494 K9483; B9999 B3407 B3383 B3372;
              B9999 B3509 B3485 B3372; B9999 B4488 B4466; B9999 B4477
              B4466; B9999 B5436 B5414 B5403 B5276; N9999 N7136 N7034
              N7023; N9999 N7090 N7034 N7023; B9999 B4035 B3930 B3838
              B3747; B9999 B4375 B4240; K9347-R K9790; B9999 B5287
              B5276; B9999 B4591 B4568; Q9999 Q7976 Q7885; Q9999 Q7932
              Q7885; Q9999 Q7896 Q7885; Q9999 Q8059 Q7987; Q9999 Q8048
              Q7987; Q9999 Q8355 Q8264; Q9999 Q8231 Q8173; Q9999 Q7705
              Q7681; Q9999 Q7545; Q9999 Q7330-R; Q9999 Q7476 Q7330;
              Q9999 Q7987-R; Q9999 Q7965 Q7885; Q9999 Q8855-R; Q9999
              Q8902 Q8899 Q8877 Q8855; Q9999 Q9201; Q9999 Q7874; Q9999
              Q9427 Q7987; Q9999 Q8366-R; K9370; N9999 N6871 N6655;
              N9999 N7089 N7034 N7023; Q9999 Q7410 Q7330; Q9999 Q8026
              Q7987; Q9999 Q7761; Q9999 Q9165-R; Q9999 Q7409 Q7330;
              Q9999 Q7567; Q9999 Q7910 Q7885; Q9999 Q7921 Q7885
     [2.3]    018; Q9999 Q8060
CMC  UPB   20011005
     M1   *01* K0   L4   L463 L499 M280 M312 M313 M314 M315 M323 M332 M342
               M383 M393 M423 M424 M430 M510 M520 M530 M540 M620 M710 M740
               M782 M904 M905 N105 Q130 Q233
               DCN: R16492-M; R16492-N

L103 ANSWER 17 OF 25  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   2001-265546 [27]   WPIX
DNN  N2001-189926
TI   Mains-independent, harmful emission-free, portable power supply has
     unit for controlling/regulating hydrogen recirculation,
     air feed and coolant circuit.
DC   X16
IN   JOERISSEN, L; ROHLAND, B; ROSER, J; SCHOLTA, J; STEINHART, K;
     ZETTISCH, G
PA   (SONN-N) ZENT SONNENENERGIE & WASSERSTOFF-FORSCH
CYC  23
PI   WO 2000063993 A1 20001026 (200127)* DE   20p    H01M008-06
        RW: AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE
         W: CA JP KR US
     EP 1175707    A1 20020130 (200216)  DE          H01M008-06
         R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
     EP 1175707    B1 20030319 (200325)  DE          H01M008-06
         R: AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
     DE 50001498   G  20030424 (200328)              H01M008-06
ADT  WO 2000063993 A1 WO 2000-DE1282 20000419; EP 1175707 A1 EP
     2000-934923 20000419, WO 2000-DE1282 20000419; EP 1175707 B1 EP
```

2000-934923 20000419, WO 2000-DE1282 20000419; DE 50001498 G DE 2000-501498 20000419, EP 2000-934923 20000419, WO 2000-DE1282 20000419

FDT EP 1175707 A1 Based on WO 2000063993; EP 1175707 B1 Based on WO 2000063993; DE 50001498 G Based on EP 1175707, Based on WO 2000063993

PRAI DE 1999-19917826 19990420

IC ICM H01M008-06
ICS H01M008-00

AB WO 200063993 A UPAB: 20010518
NOVELTY - The device has a **fuel cell** unit (1) with an **anode** chamber (2), a polymer electrolyte membrane (3), a cathode chamber (4), a hydrogen reservoir(19), a line carrying hydrogen to the **anode** chamber, a line and **pump** for **recirculating** non-converted hydrogen from the **anode** chamber outlet to its inlet, a line and **pump** for feeding air to the cathode chamber, a line for carrying away cathode gas containing. water vapor, a heat exchanger (20), a coolant circuit (18), a device for tapping the current generated and a control/regulating unit (14) for controlling/regulating the hydrogen **recirculation**, air feed and coolant circuit depending on the desired cell voltage and temp.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of generating electrical power with a portable power supply.

USE - For generating electrical power.

ADVANTAGE - The device is ready for immediate operation, mains-independent, pollutant emission-free and portable.

DESCRIPTION OF DRAWING(S) - The drawing shows a schematic representation of a power supply unit or its operation(Drawing includes non-English text).

fuel cell unit 1
anode chamber 2
polymer electrolyte membrane 3
cathode chamber 4
hydrogen reservoir 19
heat exchanger 20
coolant circuit 18
control/regulating unit 14

.
Dwg.1/1

FS EPI

FA AB; GI

MC EPI: X16-C01C; X16-C09; X16-K

L103 ANSWER 18 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2001-105080 [12] WPIX

CR 2001-105079 [12]
DNN N2001-077973 DNC C2001-031027
TI Rotary basket electroplating process connects objects being coated to cathode through basket hub, and **re circulates** electrolyte through plating bath kept sealed against gas escape.
DC M11 X25
IN BUBE, D; JANSEN, R; MUELLER, A; VAARNI, M; VAEAERNI, M; MULLER, A
PA (SURT-N) SURTEC GMBH; (WMVW-N) WMV APP GMBH & CO KG; (SURT-N) SURTEC PROD & SYSTEME OBERFLAECHENBEHAND; (WMVW-N) WMV APP GMBH CO KG
CYC 7

PI	FR 2796401	A1	20010119	(200112)*	31p	C25D005-00
	BR 2000003323	A	20010313	(200118)		C25D005-08
	DE 19932524	C1	20010329	(200118)		C25D005-08
	JP 2001158997	A	20010612	(200139)	67p	C25D017-00
	JP 3400780	B2	20030428	(200330)	15p	C25D017-00
	ES 2190702	A1	20030801	(200361)		C25D017-20
	IT 1318619	B	20030827	(200374)		C25D005-00
	US 6630060	B1	20031007	(200374)		C25D017-00

ADT FR 2796401 A1 FR 2000-8717 20000705; BR 2000003323 A BR 2000-3323 20000712; DE 19932524 C1 DE 1999-19932524 19990712; JP 2001158997 A JP 2000-211759 20000712; JP 3400780 B2 JP 2000-211759 20000712; ES 2190702 A1 ES 2000-1783 20000711; IT 1318619 B IT 2000-MI1555 20000711; US 6630060 B1 US 2000-614578 20000712
FDT JP 3400780 B2 Previous Publ. JP 2001158997
PRAI DE 1999-19932524 19990712; DE 1999-19932523 19990712
IC ICM C25D005-00; C25D005-08; C25D017-00; C25D017-20
ICS C25B009-00; C25D003-22; C25D003-38; C25D003-44; C25D017-18; C25D019-00; C25D021-10; H01M008-00; H01M008-06
AB FR 2796401 A UPAB: 20031117

NOVELTY - The items to be treated, comprising or made into conductors (e.g. plastics), are connected to the cathode through a hub (18) of the basket. The electrolyte is **pumped** around a closed circuit through the tank, which is kept closed, sealed against gas escape.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is included for the equipment, including the tank (11) with cathode (17), **anode** (20), DC supply (15) and rotary basket (16), other features being as described.

USE - For electrochemical or electrolytic treatments of objects.

ADVANTAGE - Simple implementation improves plating performance. The hub connection and basket assure reliable connection for current flowing to the items. **Recirculation** produces an even coating. Rotation mixes and redistributes them. A particular example describes zinc plating, to which the process is not limited: current densities are specified for various types of treatment solutions and applications. The equipment can be used in conjunction with a **fuel cell** with dual objectives of energy recovery

and separation of gases from the electrolyte. **Recirculated** electrolyte is accordingly extracted close to the electrodes. Spent solution is made up externally.

DESCRIPTION OF DRAWING(S) - The drawing shows a simplified schematic diagram of the electrolyte system.

tank 11
DC supply 15
rotary basket 16
cathode 17
hub 18
anode 20
Dwg.1/4

FS CPI EPI
FA AB; GI
MC CPI: M11-B; M11-C
EPI: X25-R04

L103 ANSWER 19 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1996-347269 [35] WPIX
TI Solid electrolyte **fuel cell** generating apparatus
- has turbo compressor **recirculating** part of fuel exhaust gas to **anode** inlet, increasing efficiency by reducing power required for fuel supply **pump** and compressor
NoAbstract.
DC X16
PA (MITO) MITSUBISHI JUKOGYO KK
CYC 1
PI JP 08162135 A 19960621 (199635)* 4p H01M008-04
ADT JP 08162135 A JP 1994-305869 19941209
PRAI JP 1994-305869 19941209
IC ICM H01M008-04
ICS H01M008-12
FS EPI
FA NOAB; GI
MC EPI: X16-C01

L103 ANSWER 20 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1994-081970 [10] WPIX
DNN N1994-064111
TI Breath alcohol analysing device - has disposable mouthpiece which cocks ejector and energises electrical circuit upon insertion into analyser.
DC P31 S03 S05
IN WOLF, K P W
PA (ALCO-N) ALCOTEK INC
CYC 1
PI US 5291898 A 19940308 (199410)* 13p A61B005-08
ADT US 5291898 A US 1992-886921 19920522

PRAI US 1992-886921 19920522
IC ICM A61B005-08
AB US 5291898 A UPAB: 19940421
The hand held breath analyzer is energized when a mouthpiece tube is put into position. An ejector mechanism expels the mouthpiece, which de-energizes the system. The insertion of the mouthpiece not only cocks the ejector mechanism but closes a cover on an exhaust manifold of a breath sample passage. The breath sample passage includes a sample chamber with a port to receive a sampling tube fitting, and an auxiliary port. The exhaust manifold is long relative to the length of the sampling chamber and terminates in an orifice by means of which ambient air is drawn across a thermistor.
The sampling tube communicates with a **fuel cell** chamber, into which breath is drawn by a **diaphragm pump** arranged, in its normal, uncocked condition, to inhibit the entrance of contaminants into the chamber. The **diaphragm pump** is actuated in response to operation of the thermistor, through a relay-tripped toggle linkage. A flag, connected to one of the toggle members, blocks the path of light from a photocell to a photoreceptor, insuring that the **diaphragm pump** is properly cocked for use before a breath sample is attempted to be taken.
USE/ADVANTAGE - Measurement of content of small samples of gases different from ethanol e.g gases flowing in flowing stream in industrial process or taking samples in living or working space e.g test for carbon monoxide, methane, formaldehyde.
Dwg.1/22
FS EPI GMPI
FA AB; GI
MC EPI: S03-E14H9; S05-D01C5A

L103 ANSWER 21 OF 25 WPIX
AN 1992-235007 [29] WPIX
DNN N1992-178934 DNC C1992-105977
TI Portable alkaline **fuel cell** with on-board hydrogen supply - provided by chemical hydride storage system which releases hydrogen on contact with water produced at the **anode.**
DC L03 X16
IN WARD, C A
PA (LACE-N) LACEC ENERGY SYSTEMS INC
CYC 1
PI CA 2028978 A 19920501 (199229)* 26p H01M008-06
ADT CA 2028978 A CA 1990-2028978 19901031
PRAI CA 1990-2028978 19901031
IC ICM H01M008-06
ICS H01M008-18
AB CA 2028978 A UPAB: 19931006

A power supply comprises: an alkaline **fuel cell;** a H2-storage system; means for **pumping** released H2 from an outlet of the storage system to a H2 inlet for the **fuel cell;** a source of O2; means for **pumping** O2 from the O2 source to an O2 inlet for the **fuel cell.**
The H2 storage system includes a solid chemical hydride for storing H2 in a chemically bound form, which is released when contacted by and reacted with H2O, the storage system has an outlet connected to the H2 **pumping** means. The **fuel cell** has: a H2 inlet connected to the H2 **pumping** means; an outlet for exhausting excess H2; means for passing H2 from the inlet over the **anode** to react there and vapourise water produced at the **anode** during operation of the power supply to form a H2/H2O vapour mixt. exhausted at the **fuel cell** outlet; means for **recirculating** H2/H2O vapour mixt. to an inlet of the H2 storage system to reintroduce H2O molecules to the chemical hydride to release additional H2 gas at the outlet of the storage system. Pref. the chemical hydride is selected from CaH2 and LiAlH4, and the O2 source is air from which CO2 is removed prior to entry in the system.
USE/ADVANTAGE - Lightweight portable alkaline **fuel cell** with on-board H2 generation, which is economical and can effectively operate over a broad range of temp. On-board water storage and water drainage from the **fuel cell** are unnecessary.
1/2
FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C03
DRN 1532-P; 1994-U

L103 ANSWER 22 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1989-040826 [06] WPIX
DNN N1989-031241
TI Fluid sampling system for alcohol breath test - has suction pump to draw breath across **fuel cell** with gas bag that triggers latch.
DC S03 S05
IN WILLIAMS, P M
PA (LION-N) LION TECHN LTD
CYC 15
PI EP 302681 A 19890208 (198906)* EN 7p
R: AT BE CH DE ES FR GB GR IT LI LU NL SE
AU 8820296 A 19890209 (198914)
ZA 8900010 A 19890927 (198944)
ADT EP 302681 A EP 1988-307063 19880801
PRAI GB 1987-18744 19870807

REP A3...8951; No-SR.Pub; US 2795223; US 4297871; WO 8604992
IC G01F000-00; G01N001-24
AB EP 302681 A UPAB: 19930923
The gas sampling system has a small suction **pump** including a **diaphragm** (16) connected by a passage (20) to one side (49) of a breath tube (10). The pump is arranged to draw the breath sample across the **fuel cell** (24). A small bag (40) is connected by the conduit to a passage on the other side of the breath tube. When the bag expands it releases a latch (46) engaging a stud on a button (31) attached to the diaphragm.

When the latch is released the button is raised by the spring causing the diaphragm to draw in the breath sample. An electro-chemical cell is arranged to generate an electrical signal in response to the presence of alcohol in the sample.

ADVANTAGE - Discards pre-determined volume of breath before test is made. Does not require inconvenient power supply.
1/7
FS EPI
FA AB
MC EPI: S03-E13B; S03-E14H9; S05-C09

L103 ANSWER 23 OF 25 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1986-075569 [11] WPIX
DNN N1986-055216
TI Supplying apts. for electrolyte to **fuel cell** stacks - has distributor dividing electrolyte **pumped** volume into as many streams as there are stacks.
DC X16
IN SPURRIER, F R
PA (WESE) WESTINGHOUSE ELECTRIC CORP
CYC 9
PI US 4572876 A 19860225 (198611)* 10p
ZA 8509046 A 19860612 (198636)
EP 198979 A 19861029 (198644) EN
R: DE FR GB IT NL SE
JP 61227370 A 19861009 (198647)
EP 198979 B 19900314 (199011) EN
R: DE FR GB IT NL SE
DE 3576613 G 19900419 (199017)
ADT US 4572876 A US 1985-718773 19850401; EP 198979 A EP 1985-308640 19851128; JP 61227370 A JP 1985-272338 19851202
PRAI US 1985-718773 19850401
REP 1.Jnl.Ref; EP 63199; EP 77111; FR 151100; FR 2153308; JP 60105176; US 3560264; US 4366211; EP 107396
IC H01M008-04
AB US 4572876 A UPAB: 19930922
A **pump** withdraws a predetermined volume of electrolyte from an electrolyte reservoir and propels it in a series of pulses

of predetermined duration through a transfer device to a distributor which divides the electrolyte volume into streams according to the number of **fuel cell** stacks in the module. Each portion of the electrolyte volume is then introduced into an existing electrolyte passage. The pulses of electrolyte must be of a sufficiently short duration that no electrolyte streams are still issuing within a distribution device when electrolyte has reached electrolyte passage of the **fuel cell** stack.

Gravity assists the electrolyte through an electrolyte passage within the **fuel cell** stacks. A drainage device conveys electrolyte not absorbed by the **fuel cell** matrices to an electrolyte reservoir for **recirculation.** The reservoir may comprise a tank positioned within the **fuel cell** stack module or an external tank. A filtration device may be employed to prevent **recirculation** of debris and corrosion products. A vent is used to pressure balance the appts.
0/7

ABEQ EP 198979 B UPAB: 19930922

A **fuel cell** assembly which comprises a module having at least two **fuel cell** stacks, each said **fuel cell** stack comprising a plurality of **fuel cells**, each said **fuel cell** including in a horizontal orientation an **anode** electrode, a cathode electrode, a porous matrix sandwiched between said electrodes, a top bipolar plate and a bottom bipolar plate, each said **fuel cell** stack further comprising fuel path means and oxidant path means each extending in a horizontal direction, and electrolyte passage means for guiding electrolyte through each said **fuel cell** in said **fuel cell** stack for wetting each said porous matrix with electrolyte, characterized in that an electrolyte supply apparatus is provided for supplying electrolyte to said electrolyte passage means of each said **fuel cell** stack in said **fuel cell** module as required to keep the matrix-electrode interfaces wetted with electrolyte, said supply apparatus comprising **pump** means for delivering a predetermined **pumped** volume of electrolyte in periodic pulses of predetermined duration from electrolyte reservoir means through electrolyte transfer means to electrolyte distribution means, said electrolyte distribution means diving said electrolyte **pumped** volume into as many electrolyte streams as there are **fuel cell** stacks in said **fuel cell** module and delivering each said electrolyte stream to stack supply means for transporting the electrolyte from each said electrolyte stream to said electrolyte passage means of each said **fuel cell** stack, each said periodic pulse of electrolyte provided by said **pump** means being of a sufficiently

```
FS   EPI
FA   AB
MC   EPI: X16-C; X16-F09

L103 ANSWER 24 OF 25  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   1985-005654 [01]   WPIX
TI   Breath alcohol tester - has set button to move pumping
     diaphragm forming wall of fuel cell
     chamber.
DC   B04 J04 S03 S05
IN   WOLF, K
PA   (ALCO-N) ALCOTEK INC
CYC  1
PI   US 4487055    A  19841211 (198501)*        6p
ADT  US 4487055 A US 1982-419972 19820920
PRAI US 1982-419972   19820920
IC   G01N001-14
AB   US    4487055 A UPAB: 19930925
     A tester comprises a breath-receiving tube (3) leading to a chamber
     (54) holding a fuel cell, (80) and a diaphragm
     (40) reciprocable between a down position close to the cell and an
     up position, the diaphragm forming one wall of the chamber and its
     movement pumping breath to and from the cell, the breath between
     cell and diaphragm being in unrestricted communication with the
     cell.
          A set button (4) is biased away from the cell and is movable
     towards it. A connector (45) links button and diaphragm, and a
     spider (85) between cell and diaphragm carries a guide post (71)
     which extends into a guide well (48) in the connector lower surface
     when the button is moved down. The spider legs are sufficiently
     spaced to provide no barrier to breath.
          ADVANTAGE - More reliable and recycles more rapidly than
     conventional testers.
     9/9
FS   CPI EPI
FA   AB
MC   CPI: B10-E04D; B11-C04; B11-C08; B12-K04; J04-C04
     EPI: S03-E13B1; S03-E14H9; S05-C09
DRN  0245-U; 1838-U
CMC  UPB   19930924
     M1   *02* H601 H607 H609 H684 H689 H721 M280 M312 M321 M332 M344 M363
               M391 M423 M510 M520 M530 M540 M740 M903 M910 N102 N120 P831
               V0   V743
     M2   *01* H4   H401 H481 H8   M210 M212 M272 M281 M320 M416 M620 M740
               M750 M903 M910 N102 P831
     M6   *03* M903 P831 R515 R528 R614 R633

L103 ANSWER 25 OF 25  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
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AN 1983-E1594K [13] WPIX
DNN N1983-054352
TI Gaseous coolant system for **fuel cell** - has provision for periodic reversal of coolant flow to provide uniformity operating temp..
DC X16
IN KOTHMAN, R E
PA (USAT) US DEPT ENERGY; (WESE) WESTINGHOUSE ELECTRIC CORP
CYC 9
PI EP 74701 A 19830323 (198313)* EN 17p
R: DE FR GB IT NL SE
JP 58035876 A 19830302 (198315)
ZA 8202350 A 19830419 (198325)
US 4582765 A 19860415 (198618)
ADT US 4582765 A US 1981-295976 19810825
PRAI US 1981-295976 19810825
REP GB 1558081; US 3709736
IC H01M008-04
AB EP 74701 A UPAB: 19930925
The system comprises a stack (10) of **fuel cells** layered such that intermediate cells are sections containing cooling channels arranged so that the cooling fluids are completely segregated from the process fluids in the **fuel cells**. Within the **fuel cell** (10) the **fuel** and oxidant flow parallel and counter directional to each other. The **recirculating** loop passes the coolant from and to the stack through the conduits (52), the coolant being typically helium or air between one and ten atmospheres.
The cooling fluid flows through **recirculating** loop (50) which includes in addition to the cell stack, a heat exchanger (54), a **pump** (56) and a divertor valve (58). The valve is motor operated and modulates between the two positions determined by the controller (60). Provision is made for the discharge of some coolant fluid from the conduit (50) with fresh coolant being introduced via the make up conduit (64) from the coolant source (66).
.2/4
ABEQ US 4582765 A UPAB: 19930925
Cooling channels are segregated from the process fluid flowing in reacting communication with the **anodes** and cathodes of the stack. A cooling fluid flows through a **recirculating** loop which includes, in addition to the **fuel cell** stack, a heat exchanger, a **pump**, and a diverter valve. The loop is preferably arranged so that cooling fluid exiting the stack is first cooled in the exchanger and, at a lower temperature, passed through the **pump** and returned to the stack.
The conduits connecting the loop components, and the valve, are arranged so that the direction of cooling fluid flow may be

periodically reversed. Fluid flow reversal is provided as a function of the thermal time constant of the **fuel cell** stack.
ADVANTAGE - Cooling fluid flow may be reversed without stopping or reversing **pump**.

FS EPI
FA AB
MC EPI: X16-C

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=> d l101 1-21 cbib abs hitind

L101 ANSWER 1 OF 21 HCA COPYRIGHT 2004 ACS on STN
139:71621 Procedure for starting up a **fuel cell** system having an anode exhaust recycle loop. Yang, Deliang; Steinbugler, Margaret M.; Sawyer, Richard D.; Van Dine, Leslie L.; Reiser, Carl A. (USA). U.S. Pat. Appl. Publ. US 2003129462 A1 20030710, 9 pp. (English). CODEN: USXXCO. APPLICATION: US 2002-189696 20020703. PRIORITY: WO 2002-US78 20020104.

AB The invention is about the procedure for starting up a **fuel cell** system that is disconnected from its primary load and that has air in both its cathode and anode flow fields, includes (a) connecting an auxiliary resistive load across the cell to reduce the cell voltage; (b) initiating a **recirculation** of the **anode** flow field exhaust through a recycle loop and providing a limited flow of hydrogen fuel into that recirculating exhaust; (c) catalytically reacting the added fuel with oxygen present in the recirculating gases until substantially no oxygen remains within the recycle loop; disconnecting the auxiliary load; and then (d) providing normal operating flow rates of fuel and air into resp. anode and cathode flow fields and connecting the primary load across the cell. The catalytic reaction may take place on the anode or within a catalytic burner disposed within the recycle loop. The procedure allows start-up of the **fuel cell** system without the use of an inert gas purge while minimizing dissoln. of the catalyst and corrosion of the catalyst support during the start-up process.

IC ICM H01M008-06
ICS H01M008-04
NCL 429017000; 429022000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** system starting procedure; anode exhaust recycle loop **fuel cell**
IT Exhaust gases (engine)
  Fuel cell anodes
  Fuel cells
   (procedure for starting up **fuel cell** system having anode exhaust recycle loop)
IT 1333-74-0, Hydrogen, uses 7782-44-7, Oxygen, uses
   (procedure for starting up **fuel cell** system having anode exhaust recycle loop)

L101 ANSWER 2 OF 21 HCA COPYRIGHT 2004 ACS on STN
139:55468 Method for the operation of a **fuel cell** structure. Steinfort, Marc; Huppmann, Gerhard (MTU Friedrichshafen Gmbh, Germany; MTU CFC Solutions GmbH). PCT Int. Appl. WO 2003052857 A2 20030626, 19 pp. DESIGNATED STATES: W: CA, JP, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR. (German). CODEN: PIXXD2. APPLICATION: WO 2002-EP13977 20021210. PRIORITY: DE 2001-10161838 20011215.
AB Disclosed is a **fuel cell** structure comprising **fuel cells**, each of which contains an anode and a cathode. Fresh air is admitted to the cathode inlet by means of a fresh air inlet. A combustion device is disposed between the anode outlet and the cathode inlet via an **anode** waste gas **recirculation** line for post-combusting combustible residual components contained in the used fuel gas emitted from the anode outlet, optionally in combination with fresh air admitted via the fresh air inlet. The fresh air inlet comprises a first fresh air feeding pipe connected to the combustion device for optionally admitting fresh air to the combustion device along with the used fuel gas, and a second fresh air feeding pipe for admitting fresh air to the cathode inlet while bypassing the combustion device. The quantity of fresh air admitted to the combustion device via the first fresh air feeding pipe is preferably regulated in such a way that a temp. between 750° and 1400°, preferably between 850° and 1250°, is obtained in the combustion device so as to accomplish a hot burner with the combustion device in which fewer or no inert catalytic converters at all need to be used.
IC ICM H01M008-06
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** structure operation method
IT Combustion apparatus
   (catalytic; method for operation of **fuel cell** structure)
IT Ceramics
   (conductive; method for operation of **fuel cell** structure)

IT Electric heaters
Fuel cells
(method for operation of **fuel cell** structure)
IT 58719-23-6, Iron alloy, (Fecralloy)
(method for operation of **fuel cell** structure)

L101 ANSWER 3 OF 21 HCA COPYRIGHT 2004 ACS on STN
138:371784 **Recirculation** of **anode** effluents discharged from a **fuel cell** stack to a hydrogen supply passage in a **fuel cell** power plant.
Kamihara, Tetsuya (Nissan Motor Co., Ltd., Japan). PCT Int. Appl. WO 2003043114 A2 20030522, 35 pp. DESIGNATED STATES: W: CN, KR, US; RW: AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-JP9663 20020920. PRIORITY: JP 2001-350994 20011116.
AB A **fuel cell** stack generates elec. power by reacting air with hydrogen supplied from a hydrogen supply passage and **recirculates anode** effluent resulting from power generation operations to the hydrogen supply passage through a recirculation passage via an ejector. A valve is provided for supplying hydrogen from the hydrogen supply passage to the **fuel cell** stack by bypassing the ejector. A controller maintains the **anode** effluent **recirculation** performance of the ejector when the hydrogen flow amt. in the hydrogen supply passage is small by regulating the opening of the valve. When the hydrogen flow amt. is large, the pressure in the hydrogen supply passage upstream of the ejector is prevented from excessive increases.
IC ICM H01M008-04
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** power plant **anode** effluent **recirculation**
IT **Fuel cells**
(power plants; **recirculation** of **anode** effluents discharged from **fuel cell** stack to hydrogen supply passage in **fuel cell** power plant)
IT Control apparatus
(programmable; **recirculation** of **anode** effluents discharged from **fuel cell** stack to hydrogen supply passage in **fuel cell** power plant)
IT Electric vehicles
Fuel cell anodes
Fuel cells
Pressure sensors
(**recirculation** of **anode** effluents discharged from **fuel cell** stack to hydrogen supply

passage in **fuel cell** power plant)
IT 1333-74-0P, Hydrogen, uses
(**recirculation** of **anode** effluents discharged from **fuel cell** stack to hydrogen supply passage in **fuel cell** power plant)

L101 ANSWER 4 OF 21 HCA COPYRIGHT 2004 ACS on STN
138:324140 **Recirculating anode** of an electrochemical power source. Pinto, Martin De Tezanos; Smedley, Stuart I.; Wu, Guangwei (Metallic Power, Inc., USA). PCT Int. Appl. WO 2003036749 A2 20030501, 30 pp. DESIGNATED STATES: W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM; RW: AT, BE, BF, BJ, CF, CG, CH, CI, CM, CY, DE, DK, ES, FI, FR, GA, GB, GR, IE, IT, LU, MC, ML, MR, NE, NL, PT, SE, SN, TD, TG, TR. (English). CODEN: PIXXD2. APPLICATION: WO 2002-US33178 20021016. PRIORITY: US 2001-60965 20011019.
AB The invention relates to an electrochem. power source having a cell in which a flow path delivers a flow of reaction soln. through a particulate anode and one or more particle releasers are situated along the flow path and configured to release from the cell particles which are prone to clogging due to redns. in size caused by anodic dissoln.
IC ICM H01M008-22
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 72
ST battery **recirculating anode** particle; **fuel cell recirculating anode** particle
IT Battery **anodes**
Fuel cells
Particles
Porosity
(**recirculating anode** of electrochem. power source)
IT Flow
(**recirculating**; **recirculating anode** of electrochem. power source)
IT Secondary batteries
(redox-flow; **recirculating anode** of electrochem. power source)
IT 1310-58-3, Potassium hydroxide (K(OH)), uses 7440-66-6, Zinc, uses
(**recirculating anode** of electrochem. power source)

L101 ANSWER 5 OF 21 HCA COPYRIGHT 2004 ACS on STN
138:306855 Hydrogen purged motor for **anode recirculation** blower in **fuel cell** system. Siepierski, James S.; Dumke, Ulrich (USA). U.S. Pat. Appl. Publ. US 2003077499 A1 20030424, 8 pp. (English). CODEN: USXXCO. APPLICATION: US 2001-3869 20011024.

AB A **fuel cell** system that can be used to power a vehicle is disclosed. The system includes a **fuel cell** stack, which uses hydrogen and an oxidizer to generate electricity, and a re-circulation loop that returns unreacted hydrogen to the **fuel cell** stack. The system includes a hermetically sealed assembly having a blower portion that pressurizes hydrogen in the re-circulation loop and a motor portion that drives the blower. The system also includes a source of make-up hydrogen for replenishing hydrogen in the re-circulation loop. The source introduces make-up hydrogen in the motor portion of the assembly at a pressure greater than the pressure in the blower portion of the assembly. Consequently, make-up hydrogen flows from the motor portion of the assembly into the blower portion assembly where it mixes with components in the re-circulation loop. A method of replenishing hydrogen in the **fuel cell** stack is also disclosed.

IC ICM H01M008-04
NCL 429035000; 429017000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 47
ST **fuel cell** system hydrogen recycling method app
IT Apparatus
(blowers; hydrogen purged motor for **anode recirculation** blower in **fuel cell** system)
IT Electric motors
Fuel cell anodes
Fuel cells
(hydrogen purged motor for **anode recirculation** blower in **fuel cell** system)
IT 1333-74-0, Hydrogen, uses
(hydrogen purged motor for **anode recirculation** blower in **fuel cell** system)

L101 ANSWER 6 OF 21 HCA COPYRIGHT 2004 ACS on STN
138:240722 Method of operation of **fuel cell** system. Blaszczyk, Janusz; Fleck, Wolfram (Ballard Power Systems AG, Germany). Eur. Pat. Appl. EP 1296402 A1 20030326, 6 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR. (English). CODEN: EPXXDW. APPLICATION: EP 2001-122923 20010925.

AB The invention relates to a **fuel cell** system

comprising a **fuel cell** exhibiting an anode with
a fuel feed line to feed fuel to the anode and an anode exhaust line
for removing anode exhaust from the anode and a cathode with an
oxygen feed line to feed oxygen to the cathode and a cathode exhaust
line to remove cathode exhaust from the cathode and a
recirculation line for **recirculating anode**
exhaust to the anode feed line, where the anode exhaust line is
connected to a bleed line which allows less than 5% by vol. of the
anode exhaust to bleed continuously from the anode exhaust.

IC ICM H01M010-50
ICS H01M008-04

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** system operation method

IT Reactors
(catalytic; method of operation of **fuel cell**
system)

IT Exhaust gas catalytic converters
Exhaust gases (engine)
Flammability
Fuel cells
(method of operation of **fuel cell** system)

IT 1333-74-0, Hydrogen, uses
(method of operation of **fuel cell** system)

L101 ANSWER 7 OF 21 HCA COPYRIGHT 2004 ACS on STN

138:156320 **Anode** stream **recirculation** system for a
fuel cell. Yang, Jefferson Y. S. (Asia Pacific
Fuel Cell Technologies, Ltd., Taiwan). Eur. Pat. Appl. EP 1284514
A2 20030219, 9 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES,
FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK,
CY, AL, TR. (English). CODEN: EPXXDW. APPLICATION: EP 2002-3457
20020214. PRIORITY: CN 2001-124221 20010816.

AB An **anode** stream **recirculation** system for a
fuel cell comprises an anode gas supply, a switch
and a regulating device to properly control the amt. of anode gas
supply; a sensor connected with the switch to detect the pressure of
the anode gas discharged from the **fuel cell** and
to control the open/close of the switch; and a humidifier to adjust
the humidity of the anode gas discharged from the **fuel
cell.** The discharged anode gas after the adjustment of the
humidity thereof is **redirected** to **anode** gas
input of the **fuel cell** to form an **anode**
gas **recirculation.**

IC ICM H01M008-04

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 47

ST **fuel cell anode** stream
recirculation system

IT Control apparatus
Electric switches
Fuel cell anodes
(**anode** stream **recirculation** system for
fuel cell)
IT Bubbling
(app., humidifier; **anode** stream **recirculation**
system for **fuel cell**)
IT Magnetic valves
(electromagnetic; **anode** stream **recirculation**
system for **fuel cell**)
IT Pressure sensors
(gas; **anode** stream **recirculation** system for
fuel cell)
IT Solid state **fuel cells**
(proton exchange membrane; **anode** stream
recirculation system for **fuel cell**)
IT Boilers
(steam, humidifier; **anode** stream **recirculation**
system for **fuel cell**)
IT 1333-74-0, Hydrogen, uses
(**anode** stream **recirculation** system for
fuel cell)

L101 ANSWER 8 OF 21 HCA COPYRIGHT 2004 ACS on STN
137:127605 Procedure for shutting down a **fuel cell** system having an anode exhaust recycle loop. Yang, Deliang; Steinbugler, Margaret M.; Sawyer, Richard D.; Van Dine, Leslie L.; Reiser, Carl A. (USA). U.S. Pat. Appl. Publ. US 2002102443 A1 20020801, 11 pp. (English). CODEN: USXXCO. APPLICATION: US 2001-769897 20010125.

AB A procedure for shutting down an operating **fuel cell** system that recirculates a portion of the anode exhaust in a recycle loop, includes disconnecting the primary load from the external circuit, stopping the flow of air to the cathode, and applying an auxiliary resistive load across the cells to reduce and/or limit cell voltage and reduce the cathode potential while fuel is still flowing to the anode and the **anode** exhaust is **recirculating**. The fuel flow is then stopped, but the anode exhaust continues to be circulated in the recycle loop to bring the hydrogen therein into contact with a catalyst in the presence of oxygen to convert the hydrogen to water, such as in a catalytic burner. The recirculating is continued until substantially all the hydrogen is removed. The cell may then be completely shut down. No inert gas purge is required as part of the shut-down process.

IC ICM H01M008-04
NCL 429013000

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** system shutdown procedure; anode exhaust recycle loop **fuel cell** system shutdown
IT Exhaust gases (engine)
Fuel cell anodes
Fuel cells
(procedure for shutting down **fuel cell** system having anode exhaust recycle loop)
IT 1333-74-0, Hydrogen, uses 7782-44-7, Oxygen, uses
(procedure for shutting down **fuel cell** system having anode exhaust recycle loop)

L101 ANSWER 9 OF 21 HCA COPYRIGHT 2004 ACS on STN
137:127536 Procedure for shutting down **fuel cell** system having anode exhaust recycle loop. Van Dine, Leslie L.; Steinbugler, Margaret M.; Reiser, Carl A.; Scheffler, Glenn W. (USA). U.S. Pat. Appl. Publ. US 2002098393 A1 20020725, 11 pp. (English). CODEN: USXXCO. APPLICATION: US 2001-770042 20010125.
AB A procedure for shutting down an operating **fuel cell** system that recirculates a portion of the anode exhaust in a recycle loop, includes disconnecting the primary load from the external circuit, stopping the flow of air to the cathode, and applying an auxiliary resistive load across the cells to reduce and/or limit cell voltage and reduce the cathode potential while fuel is still flowing to the anode and the **anode** exhaust is **recirculating.** The fuel flow is then stopped, but the anode exhaust continues to be circulated in the recycle loop to bring the hydrogen therein into contact with a catalyst in the presence of oxygen to convert the hydrogen to water, e.g., in a catalytic burner. The recirculating is continued until substantially all the hydrogen is removed. The cell may then be completely shut down. No inert gas purge is required as part of the shut-down process.
IC ICM H01M008-04
NCL 429013000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** shut down procedure
IT **Fuel cells**
(procedure for shutting down **fuel cell** system having anode exhaust recycle loop)

L101 ANSWER 10 OF 21 HCA COPYRIGHT 2004 ACS on STN
136:219549 **Fuel cell** power plant using reformate gas processed by a reformer. Iio, Masatoshi; Iwasaki, Yasukazu (Nissan Motor Co., Ltd., Japan). Eur. Pat. Appl. EP 1187241 A2 20020313, 15 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO. (English). CODEN: EPXXDW. APPLICATION: EP 2001-121025 20010831. PRIORITY: JP

2000-275190 20000911.

AB The hydrogen permeating to a post-sepn. side of the membrane hydrogen separator is supplied to an anode chamber of a **fuel cell** stack via a hydrogen supply passage. A hydrogen recirculation passage **recirculates** hydrogen from the **anode** chamber to the post-sepn. side. When the hydrogen partial pressure on the post-sepn. side increases, air is introduced into the hydrogen recirculation passage from an intake valve. When the hydrogen partial pressure decreases, gas in the hydrogen recirculation passage is discharged from an exhaust valve. The rate of hydrogen permeation through the membrane hydrogen separator is thereby maintained to a preferred level.

IC ICM H01M008-04
ICS H01M008-06

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 51

ST **fuel cell** power plant processed reformate gas

IT Sensors
(H detection by; **fuel cell** power plant using reformate gas processed by reformer)

IT Control apparatus
(H partial controlled by; **fuel cell** power plant using reformate gas processed by reformer)

IT Combustion apparatus
Exhaust gases (engine)
Membranes, nonbiological
(**fuel cell** power plant using reformate gas processed by reformer)

IT **Fuel cells**
(power plants; **fuel cell** power plant using reformate gas processed by reformer)

IT Fuel gas manufacturing
(steam reforming; **fuel cell** power plant using reformate gas processed by reformer)

IT 1333-74-0P, Hydrogen, uses
(**fuel cell** power plant using reformate gas processed by reformer)

IT 124-38-9, Carbon dioxide, analysis 630-08-0, Carbon monoxide, analysis 11104-93-1, Nitrogen oxide, analysis
(in exhaust gases; **fuel cell** power plant using reformate gas processed by reformer)

L101 ANSWER 11 OF 21 HCA COPYRIGHT 2004 ACS on STN

134:240133 **Recirculation** of **anode** offgas in **fuel cells.** Konrad, Gerhard; Lamm, Arnold; Autenrieth, Rainer (DaimlerChrysler A.-G., Germany). Ger. Offen. DE 19944541 A1 20010329, 6 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1999-19944541 19990917.

AB Procedure for operating of a **fuel cell**, whereby hydrogen (generated by hydrocarbon reforming) is supplied to the **fuel cell** anodes und mixed with O-contg. ions and arising anode offgas is withdrawn and added to the hydrogen. During **recirculation**, the **anode** offgas is subjected to a catalytic conversion and/or purifn. by methanation and/or selective CO-oxidn. with air supply. This **recirculated** **anode** offgas with a low CO-content is fed to the hydrogen and leads to a longer service life of the **fuel cell**.
IC ICM H01M008-04
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** hydrogen **anode** gas **recirculation**
IT **Fuel cell anodes**
  Fuel cells
 Methanation
 Recycling
 Waste gases
  (**recirculation** of **anode** offgas in **fuel cells**)
IT 1333-74-0, Hydrogen, uses
  (**recirculation** of **anode** offgas in **fuel cells**)

L101 ANSWER 12 OF 21 HCA COPYRIGHT 2004 ACS on STN
132:281555 Combined solid oxide **fuel cell** and gas turbine systems for efficient power and heat generation. Palsson, J.; Selimovic, A.; Sjunnesson, L. (Department of Heat and Power Engineering, Lund University, Lund, S-221 00, Swed.). Journal of Power Sources, 86(1-2), 442-448 (English) 2000. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science S.A..
AB The Department of Heat and Power Engineering at Lund University in Sweden has been conducting theor. studies of combined solid oxide **fuel cell** (SOFC) and gas turbine (SOFC/GT) cycles. The overall goal is an unbiased evaluation of performance prospects and operational behavior of such systems. Results of continuous studies started earlier by authors are presented. Recent developments in modeling techniques have resulted in a more accurate **fuel cell** model giving an advantage over previous system studies based on simplified SOFC models. The **fuel cell** model has been improved by detailed representation of resistive cell losses, reaction kinetics for the reforming reaction, and heat conduction through the solid part of the cell. This SOFC model has further been confirmed against the literature and integrated into simulation software, Aspen Plus. Recent calcns. have focused on a system with external pre-reforming and **anode** gas **recirculation** for the internal supply of

steam. A ref. system, sized at 500 kW, has also been analyzed in variants with gas turbine reheat and air compression intercooling. In addn., knowledge of stack and system behavior has been gained from sensitivity studies. It is shown that the pressure ratio has a large impact on performance and that elec. efficiencies of >65% are possible at low pressure ratios.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST solid oxide **fuel cell** gas turbine system
modeling
IT Simulation and Modeling, physicochemical
Solid state **fuel cells**
Turbines
(modeling of combined solid oxide **fuel cell**
and gas turbine systems for efficient power and heat generation)

L101 ANSWER 13 OF 21 HCA COPYRIGHT 2004 ACS on STN
131:146936 Solid electrolyte **fuel cell** power plant
with electrode gas recycle system. Hamada, Yukitaka; Onda, Kazuo (Ishikawajima-Harima Heavy Industries Co., Ltd., Japan). Jpn. Kokai Tokkyo Koho JP 11214021 A2 19990806 Heisei, 5 pp. (Japanese). CODEN: JKXXAF. APPLICATION: JP 1998-13677 19980127.
AB The power plant has an anode gas line for supplying anode gas contg. H and steam to solid electrolyte **fuel cells**, an anode recycle line for cooling and removing H2O from the used **anode** gas for **recirculating** into the **anode** gas line, a cathode gas line for supplying cathode gas contg. O, and a cathode recycle line for cooling the used cathode gas and recirculating into the cathode gas line. The recycle system gives high utilization efficiency of the electrode gas and optimum operation temp. without generation of pollutants.
IC ICM H01M008-04
ICS H01M008-00; H01M008-12
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST solid electrolyte **fuel cell** power plant;
electrode gas recycle cooling **fuel cell**
IT **Fuel cells**
(power plants; solid electrolyte **fuel cell**
power plant with electrode gas recycle system for optimum operation temp.)
IT Solid state **fuel cells**
(solid electrolyte **fuel cell** power plant with
electrode gas recycle system for optimum operation temp.)
IT 1333-74-0, Hydrogen, uses 7782-44-7, Oxygen, uses
(solid electrolyte **fuel cell** power plant with
electrode gas recycle system for optimum operation temp.)

L101 ANSWER 14 OF 21 HCA COPYRIGHT 2004 ACS on STN
129:177951 High-temperature **fuel-cell** stack with

heating of reaction gases. Kriechbaum, Karl; Filip, Gerhard (AEG Energietechnik G.m.b.H., Germany). Ger. Offen. DE 19706584 A1 19980827, 6 pp. (German). CODEN: GWXXBX. APPLICATION: DE 1997-19706584 19970221.

AB A portion of the anode and cathode off gases in the stack is used to preheat the incoming gases to a temp. required for the operation of and compatible with the **fuel cells.** A proper to time-related amt. of reaction gases is prepd. for the anode and/or cathode circulation, which is required for the performance of the **fuel cells**. An equiv. amt. of the anode and/or cathode off gases is removed from the gas circulation, and the amt. of the gas supplied to the circulation is measured in such a way that by mixing of this gas amt. with the **recirculated anode** and/or cathode off gas, the temp. of the anode and/or cathode incoming gases reaches an optimal operation temp. for the service life and efficiency of the cells.

IC ICM H01M008-12
ICS H01M008-04

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** stack heating reaction gas

IT **Fuel cells**
(high-temp. **fuel-cell** stack with heating of reaction gases)

L101 ANSWER 15 OF 21 HCA COPYRIGHT 2004 ACS on STN

128:206774 A **fuel cell** balance of plant test facility. Dicks, A. L.; Martin, P. A. (Ashby Road, BG plc Research and Technology, Gas Research and Technology Centre, Loughborough, UK). Journal of Power Sources, 71(1,2), 321-327 (English) 1998. CODEN: JPSODZ. ISSN: 0378-7753. Publisher: Elsevier Science S.A..

AB A test facility was designed and built to evaluate different configurations of balance of plant (BOP) equipment for a 1-5 kWe solid oxide **fuel cell** (SOFC) stack. Within this BOP project, integrated, dynamic models have been developed. These have shown that three characteristic response times exist when the stack load is changed and that three independent control loops are required to manage the almost instantaneous change in power output from a SOFC stack, maintain the fuel utilization, and control the stack temp. Control strategies and plant simplifications, arising from the dynamic modeling, have also been implemented in the BOP test facility. A SOFC simulator was designed and integrated into the control system of the test rig to behave as a real SOFC stack, allowing the development of control strategies without the need for a real stack. A novel combustor has been specifically designed, built and demonstrated to be capable of burning the low calorific anode exhaust gas from a SOFC using the oxygen depleted cathode stream. High temp., low cost, shell and tube heat exchangers have been shown to be suitable for SOFC systems. Sealing of high temp.

anode recirculation fans has, however, been shown
to be a major issue and identified as a key area for further
investigation.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** balance plant test facility; solid
oxide **fuel cell** balance plant; modeling solid
oxide **fuel cell** stack
IT Simulation and Modeling, physicochemical
Solid state **fuel cells**
(design of balance of plant test facility for solid oxide
fuel cell stacks)

L101 ANSWER 16 OF 21 HCA COPYRIGHT 2004 ACS on STN
128:182462 Dynamic model of solid polymer **fuel cell**
water management. van Bussel, Hubertus P. L. H.; Koene, Frans G.
H.; Mallant, Ronald K. A. M. (P.O. Box 1, Netherlands Energy
Research Foundation (ECN), Petten, 1755 ZG, Neth.). Journal of
Power Sources, 71(1,2), 218-222 (English) 1998. CODEN: JPSODZ.
ISSN: 0378-7753. Publisher: Elsevier Science S.A..
AB For system simplicity, it is advantageous to operate the solid
polymer **fuel cell** on dry gases at low
overpressures. Under these conditions, water management inside the
cell is a crit. issue. To det. the effect of operating conditions
on performance, a two-dimensional dynamic model is developed. Water
balance equations are written for each membrane element taking into
account prodn., drag and diffusion of water in the membrane, and
diffusion of water vapor in the gas diffusion layers. The model can
reasonably reproduce the polarization curves of a cell operated on
various oxygen fractions and can qual. describe the effect of
various operating conditions (dry gases, c.d. level, co- and
counter-flow, **anode recirculation**).
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST modeling polymer **fuel cell** water management
IT **Fuel cells**
Simulation and Modeling, physicochemical
(dynamic model of solid polymer **fuel cell**
water management)
IT 7732-18-5, Water, miscellaneous
(dynamic model of solid polymer **fuel cell**
water management)

L101 ANSWER 17 OF 21 HCA COPYRIGHT 2004 ACS on STN
124:207240 Electrochemical energy conversion and storage system with
high temperature solid oxide **fuel cells** during
off-peak operations. Isenberg, Arnold O.; Ruka, Roswell J.
(Westinghouse Electric Corp., USA). U.S. US 5492777 A 19960220, 13
pp. (English). CODEN: USXXAM. APPLICATION: US 1995-378299
19950125.

AB A solid oxide **fuel cell** (SOFC) is operated for energy storage by supplying energy and steam to a SOFC at 600-1200° to produce H and O, passing the H into a storage reactor contg. Fe oxide to produce Fe, recirculating the steam to the cathode of the SOFC, and repeating the process for complete conversion to Fe metal. For energy recovery, steam is supplied to the energy storage reactor contg. Fe metal, producing Fe oxides and H; the H is passed to the fuel anode and O is supplied to the air cathode to produce elec. energy and steam at the fuel **anode** ; the steam is **recirculated** until the Fe metal is completely converted to Fe oxide and H.
IC ICM H01M008-18
NCL 429017000
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST **fuel cell** offpeak energy storage recovery
IT Steam
(energy conversion and storage during off-peak operations with high-temp. solid oxide **fuel cells**)
IT Power
(generation; energy conversion and storage during off-peak operations with high-temp. solid oxide **fuel cells**)
IT **Fuel cells**
(high-temp. SOFC; energy conversion and storage during off-peak operations with high-temp. solid oxide **fuel cells**)
IT 1332-37-2, Iron oxide, uses 1345-25-1, Iron oxide (feo), uses 7439-89-6, Iron, uses 12031-12-8, Lanthanum manganite (lamno3) 55472-30-5
(energy conversion and storage during off-peak operations with high-temp. solid oxide **fuel cells**)
IT 1333-74-0, Hydrogen, uses
(energy conversion and storage during off-peak operations with high-temp. solid oxide **fuel cells**)
IT 7782-44-7, Oxygen, uses
(energy conversion and storage during off-peak operations with high-temp. solid oxide **fuel cells**)
IT 1314-23-4, Zirconia, uses
(scandia/yttria-stabilized; energy conversion and storage during off-peak operations with high-temp. solid oxide **fuel cells**)
IT 1314-36-9, Yttria, uses 12060-08-1, Scandia
(zirconia stabilized by; energy conversion and storage during off-peak operations with high-temp. solid oxide **fuel cells**)

L101 ANSWER 18 OF 21 HCA COPYRIGHT 2004 ACS on STN
118:172513 Modeling of current density distribution and current/voltage

relationship of adiabatically operated molten carbonate **fuel cells**. Rousar, Ivo; Brenscheidt, Thomas; Janowitz, Kosmas; Wendt, Hartmut (Chem. Tech. Coll., Prague, Czech.). Chemie Ingenieur Technik, 65(2), 206-8 (German) 1993. CODEN: CITEAH. ISSN: 0009-286X.

AB The elec. current-potential relationships and c.d. distributions of molten-carbonate **fuel cells** were computerized simulated at various operational conditions; cells operated with simple H2 fuel gas throughput, with **recirculation** of **anode** and cathode gas, and with consideration of CH4 reforming reactions as heat sink.

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST simulation elec current voltage **fuel cell**; molten carbonate **fuel cell** modeling

IT **Fuel cells**
(molten-carbonate, elec. c.d. distribution and current-potential relationship of, computerized modeling of)

IT Simulation and Modeling, physicochemical
(of elec. c.d. distribution and current-potential relationship of molten-carbonate **fuel cells**)

IT 74-82-8, Methane, uses 1333-74-0, Hydrogen, uses
(molten-carbonate **fuel cell** driven with, elec. c.d. distribution and current-voltage relationship of, computerized simulation of)

L101 ANSWER 19 OF 21 HCA COPYRIGHT 2004 ACS on STN

116:24709 Operation method for power generation system using molten-carbonate **fuel cell**. Nakazawa, Kenzo (Ishikawajima-Harima Heavy Industries Co., Ltd., Japan). Eur. Pat. Appl. EP 442352 A2 19910821, 15 pp. DESIGNATED STATES: R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE. (English). CODEN: EPXXDW. APPLICATION: EP 1991-101523 19910205. PRIORITY: JP 1990-34532 19900215.

AB The method comprises introducing cathode exhaust gas discharged from the cathode chamber into the CO2 separator, introducing CO2 contained in anode exhaust gas discharged from the anode chamber to the cathode chamber, and allowing all or part of CO2 sepd. by the separator to merge with CO2 of the **anode** exhaust gas and **recirculating** the mixt. to the cathode chamber. High-efficiency power generation is thus achieved in the molten-carbonate **fuel cell** at a low CO2 utilization factor using high-concn. CO2 cathode feed gas.

IC ICM H01M008-06
ICS H01M008-04; H01M008-14

CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)

ST **fuel cell** power generation; molten carbonate **fuel cell** operation

IT **Fuel cells**

(molten-carbonate, efficient operation of, in power generation system)

L101 ANSWER 20 OF 21 HCA COPYRIGHT 2004 ACS on STN
114:250684 Development of molten carbonate **fuel cell** power generation technology (development of 10-kW-class molten carbonate **fuel cell** generation system test facility). Watanabe, Takao; Izaki, Yoshiyuki; Mugikura, Yoshihiro; Abe, Toshio; Hamamatsu, Teruhide; Ishikawa, Hiroshi (Denryoku Chuo Kenkyusho, Yokosuka, Japan). Nippon Kikai Gakkai Ronbunshu, B-hen, 57(535), 831-6 (Japanese) 1991. CODEN: NKGBDD. ISSN: 0387-5016.
AB The development and construction of a 10 kW molten carbonate **fuel cell** stack test facility is described and thermal characteristics and gas recirculation effects on performance were studied. Under conditions of gas **recirculation** at the **anode** only, the device achieved an energy conversion efficiency of 53%.
CC 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
ST molten carbonate **fuel cell** stack; **anode** gas **recirculation** **fuel cell**
IT **Fuel cells**
(molten carbonate, stacks, test operation of, thermal characteristics and gas recirculation in)

L101 ANSWER 21 OF 21 HCA COPYRIGHT 2004 ACS on STN
102:48682 Carbonate **fuel cell** performance model. Spradlin, Louis W. (Adv. Energy Prog. Dep., Gen. Electr. Co., Schenectady, NY, 12345, USA). Proceedings - Electrochemical Society, 84-13(Molten Carbonate Fuel Cell Technol.), 488-505 (English) 1984. CODEN: PESODO. ISSN: 0161-6374.
AB An anal. model of the title cell and its assocd. subsystems was developed. The capabilities of the model was extended and model validation was studied in conjunction with an exptl. program of cell testing. The overall model includes ancillary subsystem devices such as adjustable **anode** and cathode gas **recirculation** loops with heat rejection, anode exhaust catalytic combustor for CO2 recycle, and other features in addn. to the finite slice model of the **fuel cell**. This configuration was chosen to provide the required simultaneous soln. of relation between the cell and the rest of the subsystem, detg. the performance of this portion of the integrated power generation plant. The finite slice model permits the prediction of internal cell operating characteristics such as distribution of local cell temp., gas temps., c.d., species concns., and polarization losses. In stack design activities, model calcns. indicate performance sensitivity to a no. of parametric variations providing insight into the operating characteristics of the **fuel cell**.
A coordinated exptl. cell performance program facilitated model

```
     validation efforts.
CC   52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
     Section cross-reference(s): 48
ST   carbonate fuel cell performance model
IT   Fuel cells
        (molten-carbonate, performance of, model for)


=> file wpix
FILE 'WPIX' ENTERED AT 13:20:04 ON 07 APR 2004
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FILE LAST UPDATED:            5 APR 2004      <20040405/UP>
MOST RECENT DERWENT UPDATE:      200423         <200423/DW>
DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE


=> d l104 1-21 max

L104 ANSWER 1 OF 21  WPIX  COPYRIGHT 2004 THOMSON DERWENT on STN
AN   2004-053870 [05]   WPIX
DNN  N2004-043474        DNC C2004-021785
TI   Operating cycle for solid oxide fuel cell system
     involves recirculating portion of exhaust from anode side and
     portion of exhaust from cathode side for mixing with pre-reformed
     fuel and oxidant, respectively.
DC   L03 X16
IN   LEAH, R T
PA   (ALSM) ALSTOM
CYC  102
PI   WO 2003107463 A2 20031224 (200405)* EN   47p    H01M008-00
        RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR HU IE IT
            KE LS LU MC MW MZ NL OA PT RO SD SE SI SK SL SZ TR TZ UG ZM
            ZW
         W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ
            DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP
            KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ
            NO NZ OM PH PL PT RO RU SC SD SE SG SK SL TJ TM TN TR TT TZ
            UA UG US UZ VC VN YU ZA ZM ZW
ADT  WO 2003107463 A2 WO 2003-GB2547 20030613
PRAI GB 2002-13561     20020613
IC   ICM  H01M008-00
AB   WO2003107463 A UPAB: 20040120
     NOVELTY - An operating cycle for a fuel cell
     system including a fuel cell stack involves
     recirculating a portion of exhaust from the anode side of the stack
     for mixing with fuel supplied to the pre-reformer and a portion of
     the exhaust from the cathode side for mixing with oxidant supplied
```

by the oxidant inlet.

DETAILED DESCRIPTION - An operating cycle for a **fuel cell** system including a **fuel cell** stack comprises reacting fuel supplied from a fuel pre-reformer to an anode side of the stack and oxidant supplied from an oxidant inlet to a cathode side of the stack to produce exhausts from the anode and cathode sides of the stack, respectively; and recirculating a portion of exhaust from the anode side of the stack for mixing with fuel supplied to the pre-reformer and a portion of the exhaust from the cathode side for mixing with oxidant supplied by the oxidant inlet.

An INDEPENDENT CLAIM is also included for a **fuel cell** system comprising: **fuel** inlet (2); oxidant inlet (10); a stack having an anode side and a cathode side; a fuel pre-reformer for receiving fuel from the fuel inlet, reforming it and passing it to the anode side of the stack; an oxidant preheater for receiving oxidant from the oxidant inlet, preheating it and passing it to the cathode side of the stack for reaction with the reformed fuel; an afterburner for receiving a first portion of exhaust from the anode side of the stack, burning it with additional oxidant and passing the exhaust to the oxidant preheater to preheat the oxidant; a mixing device upstream of the pre-reformer for receiving a second portion of exhaust from the anode side of the stack, mixing it with fresh fuel and passing the mixture to the pre-reformer; and heat exchanger associated with the pre-reformer for receiving exhaust from the cathode side of the stack to preheat the fuel, cool the cathode exhaust gases and pass the exhaust to the afterburner to lower the temperature.

USE - For a solid oxide **fuel cell** system (claimed).

ADVANTAGE - The size of the oxidant preheater is reduced.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic of a system with anode gas recycling.

Fuel inlet 2

Oxidant inlet 10

Dwg.1/15

TECH WO 2003107463 A2UPTX: 20040120

TECHNOLOGY FOCUS - CHEMICAL ENGINEERING - Preferred Process: A portion of exhaust from the anode side of the stack is passed to an afterburner and the exhaust from the afterburner is passed to an oxidant preheater to preheat the oxidant. Exhaust from the cathode side of the stack is passed to heat exchanger associated with the pre-reformer to preheat the fuel and cool the cathode exhaust gases. The cooled cathode exhaust is passed to the afterburner to lower the temperature.

The temperature of the stack is controlled by varying the temperature of the oxidant that enters the stack. The temperature of the oxidant that enters the stack is varied by causing a selectable

proportion of the oxidant to bypass the oxidant preheater before entering the stack. The temperature of the stack is controlled by varying the flow rate of oxidant through the stack. The flow rate of oxidant through the stack is varied by causing a selectable proportion of the oxidant to bypass the stack and join the exhaust gases from the cathode side of the stack.
Mixing of recirculated exhaust with reactants is performed by ejector driving recirculation of the exhaust. A ratio of fuel to **recirculated anode** exhaust is maintained roughly constant in the pre-reformer during normal operation of the system. During start-up of the system, the **fuel cell** stack is preheated using electric heater comprising portions which are independently switchable on and off and which are progressively switched off as the stack reaches an operating temperature. During start-up of the system, the **fuel cell** stack is bypassed so that fuel flows directly from the pre-reformer to the afterburner and burned with oxidant to preheat at least part of the rest of the system. During a hot stand-by operating mode of the system, the amounts of reactants passed through the stack are enough to produce an amount of power that, when fed back to electric heaters associated with the stack, maintains the stack at an operating temperature.

FS CPI EPI
FA AB; GI
MC CPI: L03-E04A1
EPI: X16-C01A; X16-C09

L104 ANSWER 2 OF 21 WPIX
AN 2003-449700 [42] WPIX
DNN N2003-358776 DNC C2003-119504
TI **Fuel cell** power plant for vehicle, has **fuel cell** stack, hydrogen supply passage, recirculation passage, ejector, and bypass valve.
DC L03 X16 X21
IN KAMIHARA, T
PA (NSMO) NISSAN MOTOR CO LTD; (KAMI-I) KAMIHARA T
CYC 27
PI WO 2003043114 A2 20030522 (200342)* EN 35p H01M008-04
RW: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR IE IT LU MC NL PT SE SK TR
W: CN KR US
JP 2003151593 A 20030523 (200344) 8p H01M008-04
US 2003180599 A1 20030925 (200364) H01M008-04
ADT WO 2003043114 A2 WO 2002-JP9663 20020920; JP 2003151593 A JP 2001-350994 20011116; US 2003180599 A1 WO 2002-JP9663 20020920, US 2003-362440 20030224
PRAI JP 2001-350994 20011116
IC ICM H01M008-04

ICS H01M008-10
ICA H01M008-00
AB WO2003043114 A UPAB: 20030703
NOVELTY - A **fuel cell** power plant comprises: a **fuel cell** stack for generating electric power and discharging anode effluent; a hydrogen supply passage for supplying hydrogen to **fuel cell** stack; a **recirculation** passage collecting the **anode** effluent; an ejector installed in the hydrogen supply passage; and a valve bypassing the ejector and supplying hydrogen in the hydrogen supply passage upstream of ejector.

DETAILED DESCRIPTION - A **fuel cell** power plant consists of: a **fuel cell** stack which generates electric power by reaction of air with hydrogen and discharges anode effluent containing hydrogen; a hydrogen supply passage (4) which supplies hydrogen to the **fuel cell** stack; a recirculation passage (8) which collects the anode effluent; an ejector (10) installed in the hydrogen supply passage and ejecting the **anode** effluent from the **recirculation** passage into the hydrogen supply passage using a velocity head of hydrogen; and a valve which bypasses the ejector and supplies hydrogen in the hydrogen supply passage upstream of the ejector to the **fuel cell** stack without passing through the ejector.

USE - For vehicle.

ADVANTAGE - The incorporation of valve bypassing the ejector maintains **anode** effluent **recirculation** performance of the ejector when the hydrogen flow rate is small, while preventing the pressure upstream of the ejector from becoming excessively large when the hydrogen flow rate is large. **Recirculation** performance of **anode** effluent is enhanced.

DESCRIPTION OF DRAWING(S) - The figure is a schematic diagram of the **fuel cell** power plant.

Hydrogen supply passage 4
Recirculation passage 8
Ejector 10
Bypass passage 11
Dwg.1/16

TECH WO 2003043114 A2UPTX: 20030703
TECHNOLOGY FOCUS - ELECTRONICS - Preferred Components: The **fuel cell** power plant also includes a sensor which detects (i) pressure in the hydrogen supply passage, (ii) power generation load on the **fuel cell** stack and (iii) hydrogen flow rate in the hydrogen supply passage; a programmable controller programmed to control the opening of the valve to prevent the pressure in the hydrogen supply passage from exceeding a predetermined pressure (S1 - S3, S11 - S13, S21 - S27, S31 - S33,

S41 - S43, S51 - S57); and a bypass passage (11) bypassing the ejector. The valve is disposed in the bypass passage. An orifice is disposed in the bypass passage in series with the valve. The valve comprises a throttle continuously varied between open and closed states.
The controller is further programmed to open the valve when the pressure is greater than a first predetermined pressure, and to close the valve when the pressure is less than a second predetermined pressure which is less than the first predetermined pressure. The controller is also programmed to control the valve to increase the opening of valve corresponding to increases in power generation load or hydrogen flow rate.
FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C09; X16-C15; X21-A01F; X21-B01A

L104 ANSWER 3 OF 21 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-441303 [41] WPIX
DNN N2003-352297 DNC C2003-116780
TI Particle-based electrochemical power source for metal-based **fuel cell**, has one or more cells each having particulate anode with electroactive particles, cathode, flow of reaction solution and one or more particle releasers.
DC L03 X16
IN PINTO, M D T; SMEDLEY, S I; WU, G
PA (META-N) METALLIC POWER INC
CYC 100
PI WO 2003036749 A2 20030501 (200341)* EN 30p H01M008-22
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG UZ VC VN YU ZA ZM ZW
ADT WO 2003036749 A2 WO 2002-US33178 20021016
PRAI US 2001-60965 20011019
IC ICM H01M008-22
AB WO2003036749 A UPAB: 20030630
NOVELTY - A particle-based electrochemical power source comprises one or more cells. Each cell comprises a particulate anode having electroactive particles; a cathode; a flow of reaction solution through the anode along a flow path; and one or more particle releasers situated along the path and configured to allow at least some of the particles to exit the cell in the flow of reaction solution.
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included

for a method of operating a cell within the particle-based electrochemical power source (102), comprising delivering the flow of reaction solution through the anode; allowing the anode to undergo anodic dissolution, thus reducing the size of the electroactive particles; and allowing at least some of the electroactive particles to exit the cell.

USE - For a metal-based **fuel cell** (claimed).

ADVANTAGE - The power source can provide longer term primary and/or auxiliary/backup power more efficiently and compactly. It can be refueled, and is capable of providing energy over a longer duration of time than lead acid batteries. It is regenerative in which reaction products and spent reaction solution can be processed to form a metal which are reintroduced back into the **fuel cells** to replenish anode beds as they are consumed by the electrochemical reaction.

DESCRIPTION OF DRAWING(S) - The figure is a block diagram of a metal **fuel cell.**

Particle-based electrochemical power source 102

Dwg.1/5

TECH WO 2003036749 A2UPTX: 20030630

TECHNOLOGY FOCUS - ELECTRICAL POWER AND ENERGY - Preferred Component: The particle releasers are configured to maintain the porosity (epsilon) of the anode in 0.4-0.8 to allow for efficient operation of the cell. They are configured to release the electroactive particles to prevent the nonuniform accumulation of one or more reaction products within a cell cavity. They are configured to maintain the flow of reaction solution through the anode to allow for efficient operation of the cell. The cells are combined in series or parallel. The flow is a recirculating flow of reaction solution. At least some of the electroactive particles are **recirculated** to the **anode**. The anode comprises a static or quasi-static flow of electroactive particles. Preferred Method: The flow rate of reaction solution through the anode is maintained at a superficial velocity of 10-200 cm/minute.

TECHNOLOGY FOCUS - INORGANIC CHEMISTRY - Preferred Component: The electroactive particles comprise zinc particles. The reaction solution comprises potassium hydroxide.

FS CPI EPI

FA AB; GI

MC CPI: L03-E04B
EPI: X16-C; X16-E06A

L104 ANSWER 4 OF 21 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN

AN 2003-421812 [39] WPIX

DNN N2003-336908

TI **Fuel cell** system for supply of power in various

uses has recycle lines to recycle exhausts from cathode and **anode** via **re-circulation** device in each recycle line.

DC X16
IN KNOOP, A; PEINECKE, V
PA (BALL-N) BALLARD POWER SYSTEMS AG; (BALL-N) BALLARD POWER SYSTEMS INC
CYC 102
PI WO 2003041200 A2 20030515 (200339)* EN 7p H01M008-04
RW: AT BE BG CH CY CZ DE DK EA EE ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SK SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SC SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW
DE 10155217 A1 20030528 (200343) H01M008-02
ADT WO 2003041200 A2 WO 2002-EP12519 20021108; DE 10155217 A1 DE 2001-10155217 20011109
PRAI DE 2001-10155217 20011109
IC ICM H01M008-02; H01M008-04
AB WO2003041200 A UPAB: 20030619
NOVELTY - A **fuel cell** stack (1) comprises several single cells and includes multiple anodes (2) and multiple cathodes (3), while a hydrogen-containing fuel stream is supplied to the anode through a feed line and anode exhaust is discharged through an exhaust line (5). The cathode is supplied with oxidant via a feed line (6) and the cathode exhaust is discharged through a line (7), while some of the exhaust is passed through recycle lines (9,10) by fans (11,12) with a common drive (M). One fan (12) acts as a seal.

DETAILED DESCRIPTION - AN INDEPENDENT CLAIM is included for a method of operating a **fuel cell** system.

USE - Operating **fuel cell** system.

ADVANTAGE - Recycles anode and cathode exhausts.

DESCRIPTION OF DRAWING(S) - The drawing shows the system

Anode and cathode 2,3

Exhaust lines 5,7

Recycle lines 9.10

Fans 11,12

Dwg.1/2

FS EPI
FA AB; GI
MC EPI: X16-C09; X16-C15

L104 ANSWER 5 OF 21 WPIX
AN 2003-357011 [34] WPIX
DNN N2003-285258

TI **Fuel cell** system for vehicle, includes bleed
line connected to anode exhaust line, to allow specified volume of
anode exhaust, to bleed continuously from anode exhaust.
DC X16
IN BLASZCZYK, J; FLECK, W
PA (BALL-N) BALLARD POWER SYSTEMS AG
CYC 28
PI EP 1296402 A1 20030326 (200334)* EN 6p H01M010-50
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
NL PT RO SE SI TR
US 2003064274 A1 20030403 (200334) H01M008-04
CA 2405253 A1 20030325 (200335) EN H01M008-00
ADT EP 1296402 A1 EP 2001-122923 20010925; US 2003064274 A1 US
2002-253390 20020924; CA 2405253 A1 CA 2002-2405253 20020924
PRAI EP 2001-122923 20010925
IC ICM H01M008-00; H01M008-04; H01M010-50
ICS H01M008-06
AB EP 1296402 A UPAB: 20030529
NOVELTY - Anode and cathode exhaust lines (4,8) respectively remove anode and cathode exhaust from the anode (2.1) and cathode (2.2). A recirculation line (11) connected to **anode** exhaust line, **recirculates** the **anode** exhaust to the fuel feed line (3). The anode exhaust line is connected to a bleed line (5) which allows less than 5% by volume of anode exhaust, to continuously bleed from the anode exhaust.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for **fuel cell** system operating method.

USE - **Fuel cell** system for vehicle.

ADVANTAGE - Effectively removes the impurities in the **fuel cell** system, without purging unused hydrogen to environment, thus allows the fuel system to operate continuously and efficiently.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic view of the **fuel cell** system.

anode 2.1
cathode 2.2
fuel feed line 3
anode exhaust line 4
bleed line 5
cathode exhaust line 8
recirculation line 11
Dwg.1/2
FS EPI
FA AB; GI
MC EPI: X16-C09; X16-K

L104 ANSWER 6 OF 21 WPIX
AN 2003-250215 [25] WPIX

DNN N2003-198686
TI **Anode** gas stream **re-circulation** system
for hydrogen PEM **fuel cell** re-circulation system
uses humidifier to adjust humidity of anode gas discharged from
fuel cell for reuse.
DC X16
IN YANG, Y; JEFFERSON, Y Y
PA (YATA-N) YATAI FUEL BATTERY SCI & TECH CO LTD; (ASPA-N) ASIA PACIFIC
FUEL CELL TECHNOLOGIES LTD
CYC 27
PI EP 1284514 A2 20030219 (200325)* EN 9p H01M008-04
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
NL PT RO SE SI TR
CN 1405912 A 20030326 (200344) H01M008-04
ADT EP 1284514 A2 EP 2002-3457 20020214; CN 1405912 A CN 2001-124221
20010816
PRAI CN 2001-124221 20010816
IC ICM H01M008-04
AB EP 1284514 A UPAB: 20030416
NOVELTY - An anode gas supply (60) provides hydrogen gas required
for a reaction in the **fuel cell** (80) and the gas
flows through a switch (62) and a regulating device (64) to the
fuel cell and the switch is used to control the
flow rate, while an **anode** stream **re-**
circulation system comprises a sensor (66), such as a
pressure sensor, to detect gas discharged from the **fuel**
cell. A humidifier (70) is for adjusting the humidity of the
gas discharged from the cell and then used to form gas
re-circulation.
USE - Hydrogen re-circulation in proton exchange membrane
fuel cell gas system.
ADVANTAGE - Improved overall efficiency of electrical power
generation.
DESCRIPTION OF DRAWING(S) - The drawing shows the system
Gas supply 60
Switch 62
Regulating device 64
Pressure sensor 66
Humidifier 70
Fuel cell 80
Dwg.5/6
FS EPI
FA AB; GI
MC EPI: X16-C01C; X16-C09; X16-C15

L104 ANSWER 7 OF 21 WPIX
AN 2003-147721 [14] WPIX
DNN N2003-116672

TI **Anode** stream **recirculation** system e.g. hydrogen recirculation system, has humidifier connected between anode gas output and anode gas input of **fuel cell.**
DC X16
IN YANG, J Y
PA (ASPA-N) ASIA PACIFIC FUEL CELL TECHNOLOGIES LTD
CYC 3
PI US 2002150801 A1 20021017 (200314)* 7p H01M008-04
JP 2002352831 A 20021206 (200314) 6p H01M008-04
TW 488111 A 20020521 (200320) H01M008-04
US 6699610 B2 20040302 (200417) H01M008-04
ADT US 2002150801 A1 US 2001-938959 20010824; JP 2002352831 A JP 2002-113266 20020416; TW 488111 A TW 2001-109035 20010416; US 6699610 B2 US 2001-938959 20010824
PRAI TW 2001-109035 20010416
IC ICM H01M008-04
ICS H01M008-10
AB US2002150801 A UPAB: 20030227
NOVELTY - A switch (62) is connected to anode gas supply (60) which supplies anode gas required for reaction of **fuel cell** (80). A sensor (66) connected with the switch, detects the pressure of discharged **anode** gas. **Anode** gas **recirculation** is formed by connecting humidifier (70) between anode gas input (82) and anode gas output (84). A regulating device (64) is connected between the switch and anode gas input.

USE - E.g. hydrogen recirculation system in proton exchange membrane **fuel cell.**

ADVANTAGE - Overall efficiency of electrical power generation for **fuel cell** is increased as electrical energy required for running the **anode** stream **recirculation** system is less. Simplifies the manufacturing process by improving the design of humidifier, hence attains cost reduction.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic view of gas supply **fuel cell.**

Anode gas supply 60
Switch 62
Regulating device 64
Sensor 66
Humidifier 70
Fuel cell 80
Anode gas input 82
Anode gas output 84
Dwg.4/6
FS EPI
FA AB; GI
MC EPI: X16-C09; X16-C15

L104 ANSWER 8 OF 21 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2003-015862 [01] WPIX
DNN N2003-011800
TI **Fuel cell** system operation shutting down method, e.g. for electric vehicle, involves passing air through cathode flow field during catalytic reaction of hydrogen in anode flow field with oxygen.
DC X16 X21
IN DINE, L L V; REISER, C A; SCHEFFLER, G W; STEINBUGLER, M M; VAN DINE, L L
PA (DINE-I) DINE L L V; (REIS-I) REISER C A; (SCHE-I) SCHEFFLER G W; (STEI-I) STEINBUGLER M M; (UTCF-N) UTC FUEL CELLS LLC; (ITFU) INT FUEL CELLS LLC
CYC 100
PI US 2002098393 A1 20020725 (200301)* 11p H01M008-04
WO 2002059997 A1 20020801 (200301) EN H01M008-04
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG UZ VN YU ZA ZM ZW
US 6514635 B2 20030204 (200313) H01M008-00
ADT US 2002098393 A1 US 2001-770042 20010125; WO 2002059997 A1 WO 2002-US638 20020108; US 6514635 B2 US 2001-770042 20010125
PRAI US 2001-770042 20010125
IC ICM H01M008-00; H01M008-04
AB US2002098393 A UPAB: 20030101
NOVELTY - The hydrogen in the anode flow field (128) is catalytically reacted with oxygen by **recirculating** the **anode** exhaust in a recycle loop (149) to catalytically consume the hydrogen and form water. Air is passed through the cathode flow field (122) during recirculation of the exhaust.
USE - For shutting down the operation of **fuel cell** system used in electric vehicle, power plant, etc.
ADVANTAGE - By passing air during catalytic reaction of the hydrogen and oxygen, cathode potential is reduced, hence the rate of catalyst and catalyst support corrosion are reduced, thereby increasing the speed of the shut-down process.
DESCRIPTION OF DRAWING(S) - The figure shows the schematic diagram of the **fuel cell** system.
Cathode flow field 122
Anode flow field 128
Recycle loop 149
Dwg.1/2
FS EPI
FA AB; GI

MC EPI: X16-C09; X21-A01F; X21-B01A

L104 ANSWER 9 OF 21 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-642725 [69] WPIX
DNN N2002-508048
TI Shut-down procedure for **fuel cell** system, involves reacting hydrogen in anode flow field on one side of electrolyte, catalytically with oxygen.
DC X16
IN REISER, C A; SAWYER, R D; STEINBUGLER, M M; VAN DINE, L L; YANG, D
PA (REIS-I) REISER C A; (SAWY-I) SAWYER R D; (STEI-I) STEINBUGLER M M; (VDIN-I) VAN DINE L L; (YANG-I) YANG D
CYC 1
PI US 2002102443 A1 20020801 (200269)* 11p H01M008-04
ADT US 2002102443 A1 US 2001-769897 20010125
PRAI US 2001-769897 20010125
IC ICM H01M008-04
AB US2002102443 A UPAB: 20021026
NOVELTY - Hydrogen in an anode flow field (118) on one side of an electrolyte (108), is catalytically reacted with oxygen by **recirculating** the **anode** exhaust through the anode flow field, in contact with a catalyst within a recycle loop (149). The hydrogen is catalytically consumed and the recirculation is continued until all the hydrogen in the anode flow field is removed.

USE - For **fuel cell** system.

ADVANTAGE - Reduces the rate of catalyst corrosion and pressure in the recycle loop, due to the catalyst reaction of oxygen and hydrogen.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic view of the **fuel cell** system.
Electrolyte 108
Anode flow field 118
Recycle loop 149
Dwg.1/2
FS EPI
FA AB; GI
MC EPI: X16-C09; X16-C15

L104 ANSWER 10 OF 21 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-317351 [36] WPIX
DNN N2002-248470
TI **Fuel cell** power plant for vehicle, passes gas other than hydrogen into **anode** effluent **recirculation** passage and hydrogen circulation passage, selectively.
DC X16 X21
IN IIO, M; IWASAKI, Y
PA (NSMO) NISSAN MOTOR CO LTD

CYC 28
PI EP 1187241 A2 20020313 (200236)* EN 15p H01M008-04
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK
NL PT RO SE SI TR
JP 2002093436 A 20020329 (200238) 7p H01M008-04
US 2003027024 A1 20030206 (200313) H01M008-06
ADT EP 1187241 A2 EP 2001-121025 20010831; JP 2002093436 A JP
2000-275190 20000911; US 2003027024 A1 US 2001-940547 20010829
PRAI JP 2000-275190 20000911
IC ICM H01M008-04; H01M008-06
ICS C01B003-38; C01B003-56
AB EP 1187241 A UPAB: 20020610
NOVELTY - A membrane hydrogen separator (11) separates hydrogen from reformate gas to feed to an anode chamber (2A) through a hydrogen supply path. The effluent discharged from **anode** chamber **recirculates** through **anode** effluent passage (8) to the outlet of membrane separator. An intake valve introduces a gas other than hydrogen to **anode recirculation** passage and hydrogen supply passage, which is discharged by a discharge valve (60).

USE - To power a vehicle.

ADVANTAGE - Hydrogen partial pressure on the outlet of separator is reduced. Additional equipment are minimized.

DESCRIPTION OF DRAWING(S) - The figure shows a schematic diagram of **fuel cell** power plant for vehicle.

Anode chamber 2A
Anode effluent passage 8
Membrane hydrogen separator 11
Discharge valve 60
Dwg.1/5
FS EPI
FA AB; GI
MC EPI: X16-C09; X16-C17; X21-A01F; X21-B01A

L104 ANSWER 11 OF 21 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 2002-255934 [30] WPIX
CR 2002-066073 [09]; 2002-074740 [10]; 2002-121470 [16]; 2002-303413 [34]
DNN N2002-197951 DNC C2002-076290
TI Starting method, for solid oxide **fuel cell** system in vehicles, involves using waste energy recovery assembly and reformer system to start-up and preheat solid oxide **fuel cell** system, with pressurized air-fuel mixture.
DC H06 L03 X16
IN ARMSTRONG, D J; DEMINCO, C M; FAVILLE, M T; GRIEVE, M J; HALLER, J M; HALTINER, K J; HUSTED, H L; KAMMERER, J T; KEEGAN, K R; MUKERJEE, S; NOETZEL, J G; O'BRIEN, J F; SCHUMANN, D R; SHAFFER, S R; SIMPKINS, H; VAVONESE, C C; NOETZEL, J

PA (ARMS-I) ARMSTRONG D J; (DEMI-I) DEMINCO C M; (FAVI-I) FAVILLE M T; (GRIE-I) GRIEVE M J; (HALL-I) HALLER J M; (HALT-I) HALTINER K J; (HUST-I) HUSTED H L; (KAMM-I) KAMMERER J T; (KEEG-I) KEEGAN K R; (MUKE-I) MUKERJEE S; (NOET-I) NOETZEL J G; (OBRI-I) O'BRIEN J F; (SCHU-I) SCHUMANN D R; (SHAF-I) SHAFFER S R; (SIMP-I) SIMPKINS H; (VAVO-I) VAVONESE C C; (BAYM) BAYERISCHE MOTOREN WERKE AG; (DELP-N) DELPHI TECHNOLOGIES INC
CYC 101
PI US 2002025458 A1 20020228 (200230)* 11p H01M008-06
WO 2002087052 A2 20021031 (200272) EN H02J000-00
RW: AT BE CH CY DE DK EA ES FI FR GB GH GM GR IE IT KE LS LU MC MW MZ NL OA PT SD SE SL SZ TR TZ UG ZM ZW
W: AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH CN CO CR CU CZ DE DK DM DZ EC EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ OM PH PL PT RO RU SD SE SG SI SK SL TJ TM TN TR TT TZ UA UG UZ VN YU ZA ZM ZW
US 6562496 B2 20030513 (200335) H01M008-00
EP 1382079 A2 20040121 (200410) EN H01M008-04
R: AL AT BE CH CY DE DK ES FI FR GB GR IE IT LI LT LU LV MC MK NL PT RO SE SI TR
ADT US 2002025458 A1 Provisional US 2000-201568P 20000501, US 2001-845531 20010430; WO 2002087052 A2 WO 2002-US12315 20020419; US 6562496 B2 Provisional US 2000-201568P 20000501, US 2001-845531 20010430; EP 1382079 A2 EP 2002-728838 20020419, WO 2002-US12315 20020419
FDT EP 1382079 A2 Based on WO 2002087052
PRAI US 2000-201568P 20000501; US 2001-845531 20010430; US 2001-838661 20010419
IC ICM H01M008-00; H01M008-04; H01M008-06; H02J000-00
ICS H01M008-02; H01M008-10; H01M008-12; H01M008-18
AB US2002025458 A UPAB: 20040210
NOVELTY - A heated pre-reformate, formed in a micro-reformer (123) by mixing pressurized primary supply of fuel and air, is discharged to a main reformer (122) and preheated. The secondary supply of fuel and air are fed to the main reformer, and heated main reformate is formed, and directed to a waste energy recovery assembly (126). The cathode supply (132) in the recovery assembly is heated to heat a solid oxide **fuel cell** stack (124).

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for;

(a) Solid oxide **fuel cell** system transition method;

(b) Solid oxide **fuel cell** system operating method;

(c) Solid oxide **fuel cell** system shutting method; and

(d) Solid oxide **fuel cell** mechanization for

transportation vehicle.
USE - For starting solid oxide **fuel cell** (SOFC), used in vehicles.
ADVANTAGE - As a low pressure blower is used to feed pressurized air into system chambers that contain required process control valves to keep them upstream of the high temperature regions, cost is reduced. Avoids the need to **recirculate anode** exhaust gases by operating in POx reduction mode, thus additional water is not necessary for the operation. The start-up and preheating of the system are accomplished by the reformer system and the waste energy recovery assembly through the heating and circulating of hot gases, which reduces the need for additional electrical heaters.
DESCRIPTION OF DRAWING(S) - The figure shows the system mechanization of transportation industry SOFC system.
Main reformer 122
Micro-reformer 123
Solid oxide **fuel cell** stack 124
Waste energy recovery assembly 126
Cathode supply 132
Dwg.1/3

FS CPI EPI
FA AB; GI
MC CPI: H06-A; L03-E04A1
EPI: X16-C01A; X16-C15

L104 ANSWER 12 OF 21 WPIX
AN 2001-141936 [15] WPIX
DNN N2001-103720 DNC C2001-042412
TI **Fuel cell** power generating device using waste gas of gas turbine, has anode waste gas portion of which is supplied to fuel gas line through **anode recirculation** exhaust gas line.
DC L03 X16
PA (ISHI) ISHIKAWAJIMA HARIMA HEAVY IND
CYC 1
PI JP 2000331698 A 20001130 (200115)* 5p H01M008-04
ADT JP 2000331698 A JP 1999-138606 19990519
PRAI JP 1999-138606 19990519
IC ICM H01M008-04
AB JP2000331698 A UPAB: 20010317
NOVELTY - A portion of anode waste gas is supplied to fuel gas line (20) through **anode recirculation** exhaust gas line (25). Waste gas of a gas turbine (1) is supplied to cathode of **fuel cell** (10) through gas turbine waste gas line for generating cathode gas. The fuel gas line is connected to a modifier (11) which modifies fuel gas and forms anode gas. The cathode gas and anode gas generates electricity.

USE - In **fuel cell** power generation device.
ADVANTAGE - Eliminates need for fuel preheater, since portion of the anode waste gas is mixed with the fuel gas. Enhances **fuel cell** output per unit waste gas due to **recirculation** of portion of **anode** waste gas to fuel circulation line.
DESCRIPTION OF DRAWING(S) - The figure shows the functional block diagram of the **fuel cell** power generating device.
Gas turbine 1
Fuel cell 10
Modifier 11
Fuel gas line 20
Exhaust gas line 25
Dwg.1/4

FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C09

L104 ANSWER 13 OF 21 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1999-624879 [54] WPIX
DNN N1999-461624 DNC C1999-182513
TI **Anode** gas **re-circulation** arrangement of high voltage **fuel cell** - has heat insulated reformer with modification catalyst installed by anode waste gas recycle line.
DC K05 L03 X16
PA (ISHI) ISHIKAWAJIMA HARIMA HEAVY IND
CYC 1
PI JP 11273703 A 19991008 (199954)* 5p H01M008-06
ADT JP 11273703 A JP 1998-76905 19980325
PRAI JP 1998-76905 19980325
IC ICM H01M008-06
ICS H01M008-04
AB JP 11273703 A UPAB: 20000124
NOVELTY - The anode waste gas from the fuel battery is partially **re-circulated** by an **anode** gas recycle line (14). A heat insulated reformer (18) with a modification catalyst is installed by the recycle line.
USE - For electricity generator installation like hydropower, thermal power, nuclear power plants.
ADVANTAGE - Modification reaction of hot anode waste gas is promoted as modification catalyst is used. The reform efficiency and electricity generation efficiency is increased by increasing amount of hydrogen supplied to fuel battery.
DESCRIPTION OF DRAWING - The figure shows the block diagram of high voltage fuel battery. (14) Anode gas recycle line; (18) Heat

insulated reformer.
Dwg.1/4
FS CPI EPI
FA AB; GI
MC CPI: K06-X; L03-E04
EPI: X16-C09; X16-C15

L104 ANSWER 14 OF 21 WPIX
AN 1995-055310 [08] WPIX
DNN N1995-043500 DNC C1995-025099
TI Starting operation for **fuel cell** - using electrically equipped setting which warms up circulation gas by heat transfer from cathode side.
DC L03 X16
PA (ISHI) ISHIKAWAJIMA HARIMA HEAVY IND
CYC 1
PI JP 06333585 A 19941202 (199508)* 5p H01M008-04
ADT JP 06333585 A JP 1993-145421 19930526
PRAI JP 1993-145421 19930526
IC ICM H01M008-04
AB JP 06333585 A UPAB: 19950301
The process involves isolation of a **fuel cell** (I) and a modifier (10) by interruption valves (28,29,30,31,38). The temperature of a cathode (2) is increased by heating gas recirculated from a cathode exit side to entrance side. The temperature rise of an anode (3) is raised by the heat transfer from cathode side. The downstream position of the interruption valve (30) by the side of an anode entrance and the upper position of the interruption valve (31) by the exit side of anode are connected with **anode recirculation** line (41) at the time of temperature rise. A recirculation blower (40) is provided at this line. The recirculation gas is warmed up using the heat transferred from the cathode side. A temperature rise of the piping to the interruption valve and anode entrance by the side of anode upstream takes place. The temperature of **fuel cell** and modifier returns to normal.
ADVANTAGE - Obviates cooling effect when fuel gases circulated through anode.
Dwg.1/5
FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C

L104 ANSWER 15 OF 21 WPIX
AN 1994-167774 [20] WPIX
CR 1992-284867 [34]; 1995-066386 [09]; 1996-068997 [07]; 1998-386976 [33]

DNN N1994-132012 DNC C1994-076909
TI **Fuel cell** power generation systems - in which
most of the water accumulated at the cathode is removed in the
outlet fuel stream of the anode so that need to re-circulate the
oxidant stream can be avoided.
DC L03 X16
IN PRATER, K B; VOSS, H H; WATKINS, D S; WILKINSON, D P
PA (BALL-N) BALLARD POWER SYSTEMS INC; (PRAT-I) PRATER K B; (VOSS-I)
VOSS H H; (WATK-I) WATKINS D S; (WILK-I) WILKINSON D P; (WILK-I)
WILKINSON D P
CYC 43
PI WO 9410716 A1 19940511 (199420)* EN 72p H01M008-00
RW: AT BE CH DE DK ES FR GB GR IE IT LU MC NL OA PT SE
W: AT AU BB BG BR CA CH CZ DE DK ES FI GB HU JP KP KR KZ LK LU
MG MN MW NL NO NZ PL PT RO RU SD SE SK UA
AU 9455413 A 19940524 (199434) H01M008-00
US 5366818 A 19941122 (199501) 20p H01M008-00
EP 671057 A1 19950913 (199541) EN H01M008-00
R: CH DE FR GB IT LI SE
EP 671057 A4 19951129 (199627) H01M008-00
JP 08507405 W 19960806 (199702) 48p H01M008-04
AU 675998 B 19970227 (199717) H01M008-04
CA 2146325 C 19980707 (199838) H01M008-04
EP 671057 B1 20000614 (200033) EN H01M008-00
R: CH DE FR GB IT LI SE
DE 69328874 E 20000720 (200041) H01M008-00
ADT WO 9410716 A1 WO 1993-US10333 19931028; AU 9455413 A WO 1993-US10333
19931028, AU 1994-55413 19931028; US 5366818 A CIP of US 1991-641601
19910115, US 1992-970614 19921103; EP 671057 A1 WO 1993-US10333
19931028, EP 1994-900413 19931028; EP 671057 A4 EP 1994-900413
; JP 08507405 W WO 1993-US10333 19931028, JP 1994-511303 19931028;
AU 675998 B AU 1994-55413 19931028; CA 2146325 C CA 1993-2146325
19931028; EP 671057 B1 WO 1993-US10333 19931028, EP 1994-900413
19931028; DE 69328874 E DE 1993-628874 19931028, WO 1993-US10333
19931028, EP 1994-900413 19931028
FDT AU 9455413 A Based on WO 9410716; US 5366818 A CIP of US 5260143; EP
671057 A1 Based on WO 9410716; JP 08507405 W Based on WO 9410716; AU
675998 B Previous Publ. AU 9455413, Based on WO 9410716; EP 671057
B1 Based on WO 9410716; DE 69328874 E Based on EP 671057, Based on
WO 9410716
PRAI US 1992-970614 19921103
REP 02Jnl.Ref; US 4973530
IC H01M008-04; H01M008-10; H01M008-12
ICM H01M008-00
ICS H01M008-04; H01M008-10; H01M008-12
AB WO 9410716 A UPAB: 20000831
System comprises: an H2 fuel stream; an O2 oxidant stream; a fuel
stack comprising a catalytic anode for the fuel stream, a catalytic

cathode for the oxidant stream, a cation exchange membrane for migration of cations from the anode to the cathode and for isolating the fuel stream from the oxidant stream and means for maintaining the pp of water vapour in the outlet fuel stream below the satn. pressure of the water vapour in the stream; and a water separator for removing water from the outlet fuel stream (18), so that most of the water accumulated at the cathode is absorbed in the outlet fuel stream. Modified embodiments of the system are claimed.

The stoichiometry of the inlet oxidant stream is less than 2.0; where the oxidant is pure O2, the stoichiometry is 1.0 and all the O2 is consumed; where it is impure O2, the outlet stream is dehumidified and vented. Where the inlet fuel stream is pure H2, the dehumidified outlet stream is recycled; where it is impure hydrocarbon conversion H2, the dehumidified outlet stream is vented.

USE/ADVANTAGE - As e.g. a power source for electric vehicles. Water accumulated at the cathode is removed in the outlet fuel stream of the **anode** so that **recirculation** of the oxidant stream is avoided. The system can be used with pure fuel streams (e.g. bottled H2) or impure fuel streams (e.g. hydrocarbon conversion streams), and with pure oxidant streams (e.g. bottled O2) or impure oxidant streams (e.g. air).

Dwg.3/7

ABEQ US 5366818 A UPAB: 19950110

The **fuel cell** system comprises (a) an H2-contg inlet fuel stream, (b) an O2-contg inlet oxidant stream, (c) a fuel stack comprising at least one **fuel cell** composed of (i) an anode with an inlet to direct the inlet fuel stream to the catalytically active portion, for prodn of cations, (ii) a cathode with an inlet to direct the inlet oxidant stream to the catalytically active portion to produce anions which react with the cations to form water, (iii) a cation exchange membrane between the anode and cathode, facilitating migration of cations from anode to cathode and isolating the fuel and oxidant streams, (iv) a means to conduct electric current between the electrodes, and (v) means to maintain the partial pressure of water vapour in the outlet fuel stream below the satn. pressure, and (d) a water separator to remove water from the outlet fuel stream to produce a dehumidified fuel stream and a water stream.

ADVANTAGE - A large proportion of water accumulated at the cathode is absorbed in the outlet fuel stream (claimed). Pure and impure fuel and oxidant streams can be used.

Dwg.0/7

FS CPI EPI

FA AB; GI

MC CPI: L03-E04; L03-H05
EPI: X16-C01

DRN 1532-U; 1779-U

L104 ANSWER 16 OF 21 WPIX
AN 1991-341380 [47] WPIX
DNN N1991-261411 DNC C1991-147288
TI Molten carbonate **fuel cell** power system - in which gases from anode and cathode chambers are recirculated to the combustion chamber of the fuel gas reformer.
DC L03 X16
IN KOBAYASHI, K; YOSHIDA, T
PA (ISHI) ISHIKAWAJIMA HARIMA JUKOGYO KK
CYC 15
PI EP 456848 A 19911121 (199147)*
R: AT BE CH DE ES FR GB GR IT LI LU NL SE
CA 2016536 A 19911111 (199206)#
US 5094926 A 19920310 (199213) 8p
ADT EP 456848 A EP 1990-109042 19900514; US 5094926 A US 1990-518568 19900503
PRAI EP 1990-109042 19900514
REP 4.Jnl.Ref; JP 01105475; JP 01128364; JP 59027469; JP 63126173; US 3585077; US 4128700
IC H01M008-06
AB EP 456848 A UPAB: 19930928
Electric power system includes a molten carbonate **fuel cell** (25) and a reformer (26) which is supplied with fuel gas (31) and steam (36). Gases discharged from cell anode chamber (27) are supplied to the reformer combustion chamber (30) where they are burned with air (43) to heat the reforming chamber (29). H2-rich gas from the reforming chamber (29) is supplied to anode chamber (27), air (43) is supplied to cathode chamber (28) and cathode exhaust is partially fed to the combustion chamber (30) while the remainder is discharged.

ADVANTAGE - System allows the pressure differences between the anode and cathode chambers to be maintained within a suitable range without controlling entrance and exit pressure difference of the chambers. Heat produced by the system can also be efficiently recovered.
1/2
ABEQ US 5094926 A UPAB: 19930928
Electric powder producing system comprises (a) molten carbonate **fuel cell** including anode and cathode chambers, air and carbon dioxide fed to cathode chamber; and (b) reformer for reforming fuel gas into anode gas, also including combustion chamber to maintain reforming reaction temp., fuel gas and steam fed in reforming chamber.

Fuel gas is fed to reforming chamber with steam. Hydrogen gas obtd. in reforming chamber is fed into anode chamber at **fuel cell**. Air is introduced into cathode chamber. Gases from anode chamber are directly fed into combustion chamber. A portion of the gases are directly fed, with the remainder discharged from the

system, giving no substantial pressure difference between anode and cathode chambers.
USE/ADVANTAGE - For electric power prodn. System, using molten carbonate **fuel cell**. Exhaust heat is effectively recovered.

FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C

L104 ANSWER 17 OF 21 WPIX
AN 1991-332499 [45] WPIX
DNN N1991-254864
TI **Fuel cell** power plant limiting pressure difference - controls pressure between cathode and anode by valve complex in **anode recirculation** loop even when there is no flow through anode.
DC X16
IN LANDAU, M B; VARTANIAN, G
PA (ITFU) INT FUEL CELLS CORP
CYC 2
PI US 5059494 A 19911022 (199145)*
WO 9117578 A 19911114 (199148)
W: JP
JP 05501174 W 19930304 (199314) H01M008-04
ADT US 5059494 A US 1990-521480 19900510; WO 9117578 A WO 1991-3279 19910510; JP 05501174 W JP 1991-509431 19910510, WO 1991-US3279 19910510
FDT JP 05501174 W Based on WO 9117578
PRAI US 1990-521480 19900510
REP JP 60158559; JP 60165063; US 4769297
IC ICM H01M008-04
AB US 5059494 A UPAB: 19940715
Pressure differential (6) between cathode (2) and anode (3) is controlled by valve (24, 26) of valve complex (20). The complex is located within **anode recirculation** loop (8, 9, 3, 20) whereby controllability is not lost with no flow through the anode. Control is thereby retained during nitrogen purging of the cathode.
An orifice (22) in the valve complex precludes accidental full closure of the complex, and is selected to avoid immediate damage to the **fuel cell** on such closure.
ADVANTAGE - Cell cross presure control of the prior art is achieved without dange of immediate damage in the event of a closed valve failure of the control valve. Furthermore, the ability to maintain pressure differential across the electrolyte membrane is achieved during nitrogen purging with the plant shut down. @(6pp Dwg.No.1/3)@

1/3
FS EPI
FA AB; GI
MC EPI: X16-C

L104 ANSWER 18 OF 21 WPIX COPYRIGHT 2004 THOMSON DERWENT on STN
AN 1991-247074 [34] WPIX
DNN N1991-188394 DNC C1991-107214
TI Power generation system - using molten carbonate **fuel cell** and providing high efficiency at low carbon di oxide utilisation factor.
DC L03 X16
IN NAKAZAWA, K
PA (ISHI) ISHIKAWAJIMA HARIMA HEAVY IND; (ISHI) ISHIKAWAJIMA HARIMA JUKOGYO KK
CYC 17
PI

EP 442352	A	19910821	(199134)*		15p	
R: AT BE CH DE ES FR GB GR IT LI LU NL SE						
CA 2036291	A	19910816	(199143)			
JP 03238765	A	19911024	(199149)			
CN 1054507	A	19910911	(199224)			H01M008-14
US 5134043	A	19920728	(199233)		15p	H01M008-06
EP 442352	A3	19920520	(199331)		15p	
CA 2036291	C	19940607	(199428)			H01M008-04
CN 1023435	C	19940105	(199518)			H01M008-06
EP 442352	B1	19950503	(199522)	EN	17p	H01M008-06
R: DE GB IT NL						
DE 69109326	E	19950608	(199528)			H01M008-06
JP 2819730	B2	19981105	(199849)		10p	H01M008-04

ADT EP 442352 A EP 1991-101523 19910205; JP 03238765 A JP 1990-34532 19900215; CN 1054507 A CN 1991-101027 19910213; US 5134043 A US 1991-654837 19910213; EP 442352 A3 EP 1991-101523 19910205; CA 2036291 C CA 1991-2036291 19910213; CN 1023435 C CN 1991-101027 19910213; EP 442352 B1 EP 1991-101523 19910205; DE 69109326 E DE 1991-609326 19910205, EP 1991-101523 19910205; JP 2819730 B2 JP 1990-34532 19900215
FDT DE 69109326 E Based on EP 442352; JP 2819730 B2 Previous Publ. JP 03238765
PRAI JP 1990-34532 19900215
REP NoSR.Pub; 2.Jnl.Ref; EP 400701; JP 01187775; JP 57080674; US 3359134; US 4080487; US 4722873
IC ICM H01M008-04; H01M008-06; H01M008-14
ICS H01M008-22; H01M008-24
AB EP 442352 A UPAB: 19931118
A method is described for operating a power generation system using a **fuel cell** (I) which includes an electrolyte plate (1) sandwiched between a cathode provided with a cathode chamber (2), and an anode, provided with an anode chamber (3).

Oxidising gas is fed to the cathode chamber and fuel gas (FG) is fed to the anode chamber for power generation, using a CO2 separator.

The method comprises: (a) introducing gases (referred to as cathode exhaust gas) discharged from the cathode chamber (2) into the CO2 separator (27); (b) introducing CO2 contained in gases (referred to as anode exhaust gas) discharged from the anode chamber (3) to the cathode chamber (2); and (c) allowing all or part of the CO2 sepd. by the CO2 separator (27) to merge with CO2 of the **anode** exhaust gas and **recirculating** them to the cathode chamber (2), whereby highly efficient power generation is achieved in the **fuel cell** at a low CO2 utilisation factor, using CO2 of high concn. fed to the cathode chamber (2).

USE/ADVANTAGE - A large amt. of CO2, which promotes the **fuel cell** reaction, is retained in the cathode chamber and the CO2 partial pressure from the entrance of the cathode chamber through to its exit is maintained at a high level, thereby improving generation efficiency. The amt. of CO2 exhausted to the atmos. is reduced. @(15pp Dwg.No.1/12)@
1/12

ABEQ US 5134043 A UPAB: 19930928
Operating a **fuel cell** comprises passing gases contg. CO2 discharged from the cathode to a separator while exhaust gases from the anode contg. CO2 are passed to the cathode chamber. At least part of the CO2 sepd. by the separator is mixed with the **anode** exhaust gas and **recirculated** to the cathode chamber.

ADVANTAGE - Enhanced power efficiency in **fuel cells** with a low CO2 use factor by raising the concn. of CO2 in the cathode chamber. Pref. the fuel gas fed to the anode chamber is hydrogen contg. about 25% of CO2 obtd. e.g. by forming natural gas.
3/14

ABEQ EP 442352 B UPAB: 19950609
A method of operating a power generation system using at least two **fuel cells** (I,II) connected to each other in series, one **fuel cell** (I) being located upstream of a next **fuel cell** (II), the **fuel cell** (I;II) including an electrolyte plate (1) sandwiched by a cathode electrode and an anode electrode with a cathode chamber (2) being provided on the cathode electrode and an anode chamber (3) being provided on the anode electrode and with oxidising gas being fed to the cathode chamber (2) and fuel gas being fed to the anode chamber (3) for power generation, said method comprises the steps of: (A) introducing air to the cathode chamber (2) of the most upstream **fuel cell** (I); (B) introducing the fuel gas (FG) to the anode chamber of each **fuel cell** (I;II); (C) **recirculating** CO2 of the **anode**

exhaust gas discharged from the anode chamber (3) of each **fuel cell** (I), except the most downstream **fuel cell** (II), to the cathode chamber (2) of the same **fuel cell** (I); (D) introducing CO_2 of the anode exhaust gas discharged form the most downstream **fuel cell** (II), to the cathode chamber (2) of the most upstream **fuel cell** (I); and (E) introducing part or all of the cathode exhaust gas discharged from each **fuel cell** (I), to the cathode chamber of the **fuel cell** (II) downstream thereof (I), whereby the power generation of high efficiency is achieved in all the **fuel cells** (I,II) at a low CO_2 utilisation factor, using CO_2 of high concentration fed to the cathode chambers (2) of the **fuel cells** (I,II).
Dwg.2/11

FS CPI EPI
FA AB; GI
MC CPI: L03-E03
EPI: X16-C
DRN 1066-U

L104 ANSWER 19 OF 21 WPIX
AN 1990-202654 [27] WPIX
DNN N1990-157714 DNC C1990-087667
TI Molten carbonate **fuel cell** appts. - including recycling anode exhaust gas to anode via reformer after removal of carbon di oxide.
DC L03 X16
IN KINOSHITA, N
PA (ISHI) ISHIKAWAJIMA-HARIMA
CYC 16
PI EP 376219 A 19900704 (199027)*
R: AT BE CH DE ES FR GB GR IT LI LU NL SE
JP 02172159 A 19900703 (199032)
CA 2002227 A 19900624 (199037)
US 5039579 A 19910813 (199135)
US 5068159 A 19911126 (199150)
EP 376219 B1 19930630 (199326) EN 15p H01M008-06
R: DE GB NL
DE 68907398 E 19930805 (199332) H01M008-06
ADT EP 376219 A EP 1989-123844 19891222; JP 02172159 A JP 1988-324797 19881224; US 5039579 A US 1991-649250 19910131; US 5068159 A US 1989-424134 19891019; EP 376219 B1 EP 1989-123844 19891222; DE 68907398 E DE 1989-607398 19891222, EP 1989-123844 19891222
FDT DE 68907398 E Based on EP 376219
PRAI JP 1988-324797 19881224
REP 9.Jnl.Ref; FR 1436747; FR 2012819; JP 56069775; JP 57009071; JP 57019974; JP 57078774; JP 60156063; JP 61024171; JP 62237673; JP

62274561; JP 63174282; US 3297483; US 3359134; FR 2301103; JP 0156063

IC H01M008-06

AB EP 376219 A UPAB: 19930928

In the operation of a molten carbonate **fuel cell**, CO_2 is sepd. from the anode exhaust gas, the remaining gas is **recirculated** to the **anode** and the CO_2 is supplied to the cathode as cathode gas. Pref. the anode supply gas is CO/H_2 from a reformer and unreacted CO in the anode exhaust is reacted with steam to form CO_2 and H_2.

Pref. the CO_2 is mixed with air, supplied to a combustion device along with a portion of the anode recycle gas and the exhaust from the combustion device is then supplied to the cathode.

ADVANTAGE - Sepn. of CO_2 from the anode exhaust prior to recycle increases cell efficiency.

1/10

ABEQ US 5039579 A UPAB: 19930928

Appts. comprises molten carbonate **fuel cell** comprises (a) molten **fuel cell** having impregnated electrolyte tile between anode and cathode in respective chambers; (b) anode gas feed and exhaust gas lines connected with inlet and outlet of **fuel cell**; (c) cathode gas feed and exhaust line connected to cathode chamber of **fuel cell**; (d) **fuel** gas feed into anode feed line; (e) fuel gas and stream reformer; (f) carbon dioxide separator to remove dioxide from anode exhaust; (g) line for **recirculating anode** exhaust gas into reformer; and (h) device to feed sepd. carbon dioxide gas into cathode feed line.

USE/ADVANTAGE - Produces electrical power using molten carbonate **fuel cell**, to convert chemical energy of fuel to electrical power. Improves efficiency of power prodn.

ABEQ US 5068159 A UPAB: 19930928

Electric power is produced by (a) sepg.CO_2 from an **anode** exhaust gas, (b) **recirculating** the **anode** exhaust gas after sepn. into the anode chamber, and (c) feeding the CO_2 into the cathode chamber. CH_4 is steam reformed to obtain the anode gas. The exhausted gas after sepn. is fed into the reformer together with the fuel gas and steam, then **recirculated** to the **anode** chamber.

Pref. (a) is by vapour-liq. contact with a CO_2-absorbing liq. e.g. aq. alkali salt, aq. amine soln. etc.

USE/ADVANTAGE - Used in a molten carbonate type **fuel cell** (claimed). Improved power-producing efficiency.

ABEQ EP 376219 B UPAB: 19931116

A method of producing electric power with a molten carbonate type **fuel cell** (1) wherein an anode gas is fed into an anode chamber (3) of the **fuel cell** (1) and a cathode gas is fed into a cathode chamber (4) thereof, wherein the

method comprises the steps of: (A) introducing a fuel gas and stream into a reformer (5) so as to reform the fuel gas with the stream to give an anode gas containing H2 and CO and then feeding the resulting anode gas into the anode chamber (3) of the **fuel cell** (1); (B) separating carbon dioxide gas from the anode exhaust gas as exhausted from the **anode** chamber; and (C) **recirculating** the **anode** exhaust gas from which carbon oxide gas has been removed in the step (B), to the anode chamber (3) via the reformer as the anode gas; characterised by (D) introducing into air the carbon dioxide gas as separated from the anode exhaust gas and feeding the resulting mixed gas into a combustion device (27) while part of the anode exhaust gas, from which carbon dioxide gas has been removed, is fed into said combustion device (27) and is combusted there, and the outlet gas from the combustion device (27) is fed into the cathode chamber (4) as cathode gas.

Dwg.1/7

FS CPI EPI
FA AB; GI
MC CPI: L03-E04
EPI: X16-C
DRN 1066-P; 1391-U; 1532-P

L104 ANSWER 20 OF 21 WPIX
AN 1988-205015 [29] WPIX
DNN N1988-156469
TI **Fuel cell** configuration for contaminated fuel gases - has **anode** exhaust partially **recirculated** into **anode** inlet to mix with incoming fuel gas.
DC X16
IN SAWYER, R D; TROCCIOLA, J C
PA (ITFU) INT FUEL CELLS CORP
CYC 6

PI	US 4755439	A	19880705	(198829)*		7p	
	EP 284023	A	19880928	(198839)	EN		
	R: DE FR GB						
	JP 63254674	A	19881021	(198848)			
	CA 1299237	C	19920421	(199221)			H01M008-04
	EP 284023	B1	19930804	(199331)	EN	10p	H01M008-06
	R: DE FR GB						
	DE 3882756	G	19930909	(199337)			H01M008-06

ADT US 4755439 A US 1987-32202 19870325; EP 284023 A EP 1988-104569 19880322; JP 63254674 A JP 1988-68358 19880324; CA 1299237 C CA 1988-562232 19880323; EP 284023 B1 EP 1988-104569 19880322; DE 3882756 G DE 1988-3882756 19880322, EP 1988-104569 19880322
FDT DE 3882756 G Based on EP 284023
PRAI US 1987-32202 19870325
REP 1.Jnl.Ref; US 4642272; US 4647516; EP 242200

IC ICM H01M008-04
ICS H01M008-06

AB US 4755439 A UPAB: 19930923

The **fuel cell** system comprises an electrolyte matrix and a device forming an anode gas space on one side of the electrolyte matrix through which gas space the fuel gas flows from an inlet side of the and gas space, forming a cathode gas space on the opposite side of the electrolyte matrix. A porous anode substrate is interposed between the anode gas space and the electrolyte matrix, and a porous cathode substrate is interposed between the cathode gas space and the electrolyte matrix.

A catalyst layer is on the cathode substrate on a side of it facing the electrolyte matrix; and a catalyst layer is on the anode substrate on a side of it facing the electrolyte matrix. The catalyst layer on the anode substrate includes an extended strip of it which extends toward the anode gas space inlet side and which also extends beyond an edge of the catalyst layer on the cathode substrate closest to the anode gas space inlet side.

2/2

ABEQ EP 284023 B UPAB: 19931118

A **fuel cell** system adapted to use oxygen-contaminated hydrogen rich fuel gas, said system comprising: a) a porous anode substrate (28); b) a porous cathode substrate (30); c) an electrolyte matrix (8) sandwiched between said anode and cathode substrates (28 30); d) an anode catalyst layer (32) on said anode substrate (28) on a side thereof facing said electrolyte matrix (8); e) a cathode layer (34) on said cathode substrate (30) on the side thereof facing said electrolyte matrix (8); f) an anode gas space (4) on the side of said anode substrate (28) opposite said electrolyte matrix (8); said anode gas space (4) having an inlet side and being provided for a flow of said fuel gas; g) a cathode gas space (6) on the side of said cathode substrate (30) opposite said electrolyte Matrix (8), said cathode gas space (6) being provided for a flow of oxidant gas; h) a first zone in said **fuel cell** system, where said anode catalyst layer (32) and said cathode catalyst layer (34) are coextensive, said first zone being an electrochemically active zone provided for the electrochemical reaction between said fuel gas and said oxidant gas; i) a second zone in said **fuel cell** system, where said anode catalyst layer (32) extends beyond an edge of said first zone toward said anode gas space inlet side said second zone being substantially electrochemically inactive for said electrochemical reaction between said fuel gas and said oxidant gas but being provided as a zone in which oxygen contaminant in the incoming fuel gas is consumed to reduce the percentage of said oxygen in said fuel gas before said fuel gas reaches said first zone, whereby unacceptably high operating temperatures in said first zone are avoided.

Dwg.0/0
FS EPI
FA AB; GI
MC EPI: X16-C

L104 ANSWER 21 OF 21 WPIX
AN 1985-203153 [33] WPIX
DNN N1985-152408 DNC C1985-088635
TI **Fuel cell** system of the internally reforming type - in which exhausted gas is applied to gas separator device to remove fuel process gas for recycle.
DC L03 X16
IN BAKER, B S; GHEZEAYAG, H G
PA (ENER-N) ENERGY RES CORP; (MITQ) MITSUBISHI DENKI KK
CYC 8
PI US 4532192 A 19850730 (198533)* 7p
EP 180941 A 19860514 (198620) EN
R: DE FR GB IT
JP 61114478 A 19860602 (198628)
BR 8505528 A 19860812 (198639)
CA 1263695 A 19891205 (199002)
EP 180941 B 19910515 (199120)
R: DE FR GB IT
DE 3582861 G 19910620 (199126)
ADT US 4532192 A US 1984-668703 19841106; EP 180941 A EP 1985-113979 19851104; JP 61114478 A JP 1985-247282 19851106
PRAI US 1984-668703 19841106
REP 3.Jnl.Ref; A3...8730; FR 2012819; FR 2301103; GB 1154522; GB 2025118; JP 57009071; JP 60001985; JP 61024171; No-SR.Pub; US 3297483; US 3359134; US 3446674; US 3489670; US 3527618; US 4080487
IC C25B001-02; H01M008-06
AB US 4532192 A UPAB: 19930925
A **fuel cell** system adapted to receive fuel having hydrocarbon content from a fuel supply, the **fuel cell** system comprises (a) a **fuel cell** including: means internal of the cell for reforming the hydrocarbon content of the fuel from the supply to produce fuel process gas; and (b) anode and cathode sections for receiving fuel process gas and oxidant process gas; and means for receiving the gas exhausted from the anode section and for sepg. from the exhaust gas fuel process gas contained in the exhausted gas to the exclusion of the other gases contained in the exhaust gas, to thereby provide sepd. fuel process gas and remaining exhausted gas.

ADVANTAGE - **Fuel cell** system wherein **fuel** process gas is more efficiently used, and in which internal reforming is used to produce hydrogen fuel process gas and wherein utilisation of the hydrogen gas is increased.
1/8

ABEQ EP 180941 B UPAB: 19930925
Fuel cell system adapted to receive fuel having hydrocarbon content from a fuel supply, comprising a **fuel cell** (2) internal of which said hydrocarbon content of said fuel from said supply is reformed to produce fuel process gas and which includes anode and cathode sections (2a, 2b) for receiving fuel process gas and oxidant process gas; and a gas separation device (6) which receives the gas exhausted from the anode section (2a) and separates from said anode exhaust gas fuel process gas contained in said anode exhaust gas - characterised - in that the gas separation device (6) separates unused hydrogen process gas from the anode exhaust gas and in that the separated hydrogen process gas is recirculated by **recirculating** means to the **anode** section.

FS CPI EPI
FA AB
MC CPI: L03-E04
EPI: X16-C